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TO TODAY'S TECH

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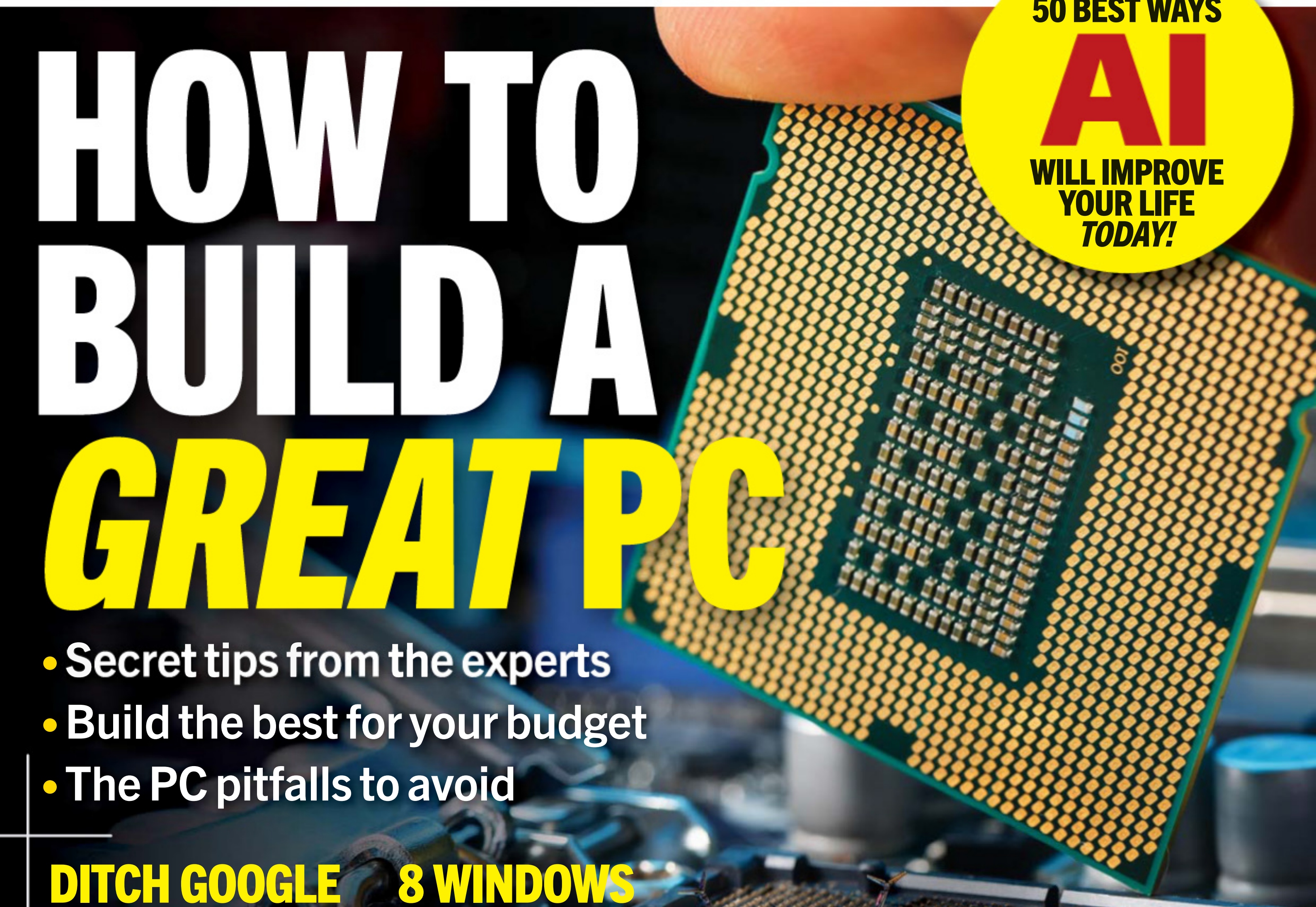

50 BEST WAYS AI WILL IMPROVE YOUR LIFE *TODAY!*

HOW TO BUILD A *GREAT PC*

- Secret tips from the experts
- Build the best for your budget
- The PC pitfalls to avoid

DITCH GOOGLE FOR PROTON

WHY IT'S **BETTER & SAFER** FOR EMAIL, VPN, PASSWORDS & STORAGE

8 WINDOWS TOOLS YOU'LL USE EVERY DAY

HIDDEN POWERTOYS TO GIVE YOU CONTROL

APC VERDICT

BORDERLANDS 4

IS THIS LOOTER SHOOTER HEAVEN?

GEAR

ASUS SPLITS THE KEYBOARD

DESIGN GENIUS OR UTTER MADNESS?

PLUS

- SECRETS OF WW2's COLOSSUS
- HANDHELD PCs: THE REAL DEAL?
- HOME NETWORK ADMIN TIPS
- SUPERCHARGE YOUR MAC
- COMMODORE IS BACK! & *MORE*

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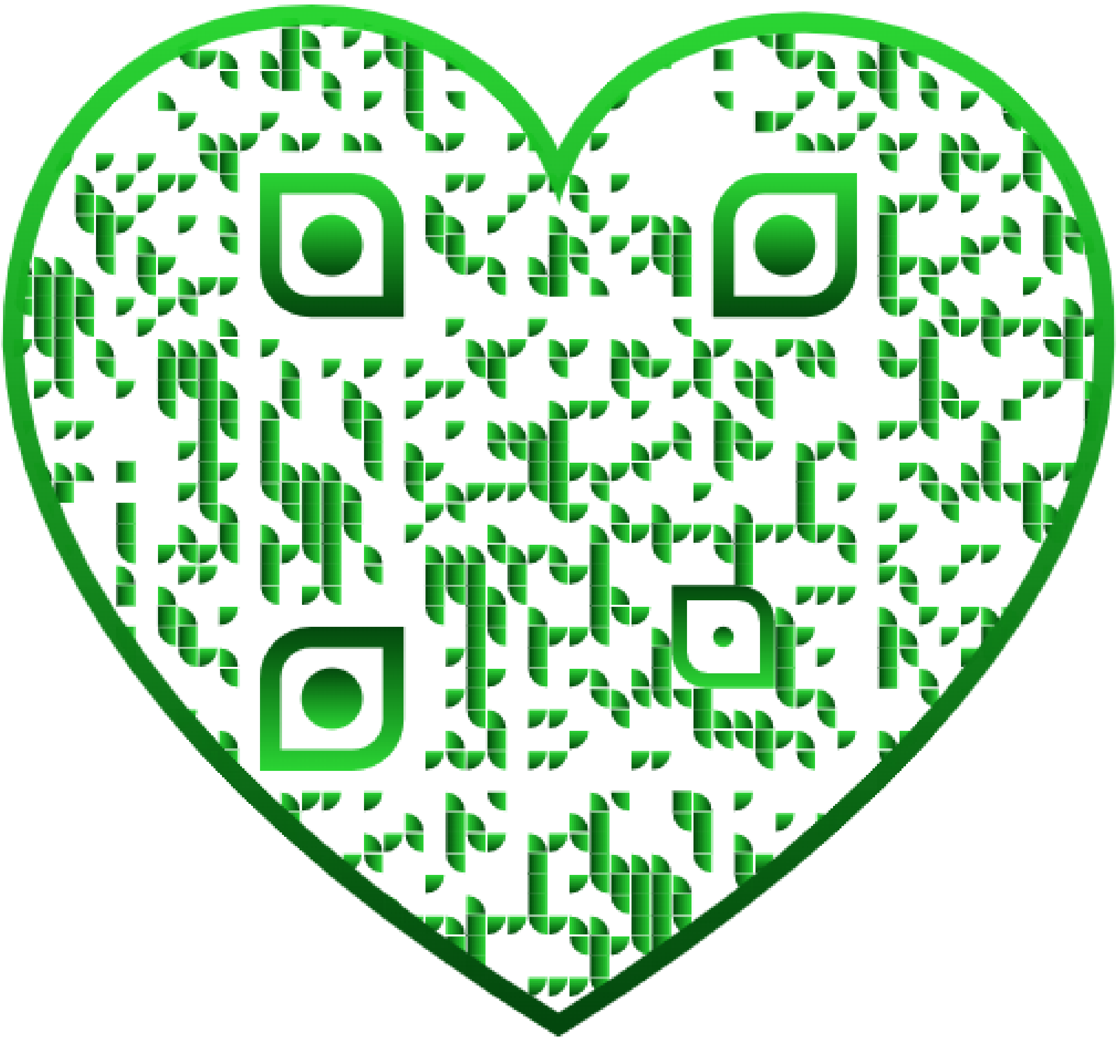

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Refreshing

More *APC* for you.

Well look at this, *APC* just gained weight! We've added another 16 beautiful pages so we can share more with you in every issue. This gives us a bit more room to expand our coverage of what's happening, and I'm quite excited to be able to use this extra space, especially to make our Downtime section at the back of the mag bigger. That's where the not-quite-hardcore tech stuff goes, so we'll be able to do more on the world of PC gaming, leisure tech like handhelds, as well as nice retro features, and the tech we use just for fun.

The rest of *APC* remains largely unchanged, though we have been tweaking some areas lately to keep the content as relevant and useful to you as possible. That's been mostly with our How To guides, which we think is an especially valuable part of *APC*, letting us show you how to get more from what you've got, and understand your gear better. Plus, we've given the overall page design a bit of a refresh too, so all-up it's looking rather nice. I hope you like this freshening up, and as always I love hearing your thoughts (ben.mansill@futurenet.com).

Our lead feature in this issue is a big explainer for those looking to build a new PC, or upgrade select components in the PC you already have. The guide covers what to look for, and how to choose your gear to ensure you're spending wisely and not unnecessarily. We consulted experts in the retail PC building front lines for this one, and their perspective and real-world experience is priceless. This is not a guide that shows you how to plug things in and screw bits together, we've done a lot of that recently and you all know how to wield your tools. The goal here is to bring you up to speed with the choices available and share some behind the scenes pro-tips you can use to give you the confidence to hit that upgrade.

Check out our Proton feature, too. This Swiss company is going hard on every front, offering legitimate alternatives to most of the Google products many or most of us use daily. Proton is the real deal for features and functionality, while lifting the bar on privacy in ways Google is falling behind on. ■

HOT TAKES

"Google remains the most notorious tech company for invading its users' privacy. It tracks you around the web, across your devices and even in the real world."

DITCH GOOGLE FOR PROTON. Page 34.

"Jensen Huang seems to have played a masterstroke here, taking advantage of Intel's recent weakness to simultaneously improve Nvidia's AI offerings and potentially killing off the third GPU competitor before it fully takes root."

SYSTEM NEWS. Page 12.

"Customers buy liquid coolers, not realising there is a longevity issue with those things. And you need to keep an eye on them, because they do leak."

HOW TO BUILD A GREAT PC. Page 42.

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LocaLingo's standout feature is its complete offline functionality, keeping all data on your computer to ensure absolute protection for sensitive content like legal, medical, or business documents. With its user-friendly interface, extensive file support, and outstanding translation quality, Ashampoo LocaLingo offers a powerful blend of convenience and security in translation solutions.

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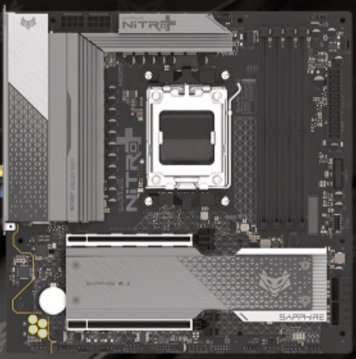

SAPPHIRE NITRO+

NITRO+ B850M WIFI

SAPPHIRE PURE

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SAPPHIRE PULSE

PULSE B850M WIFI

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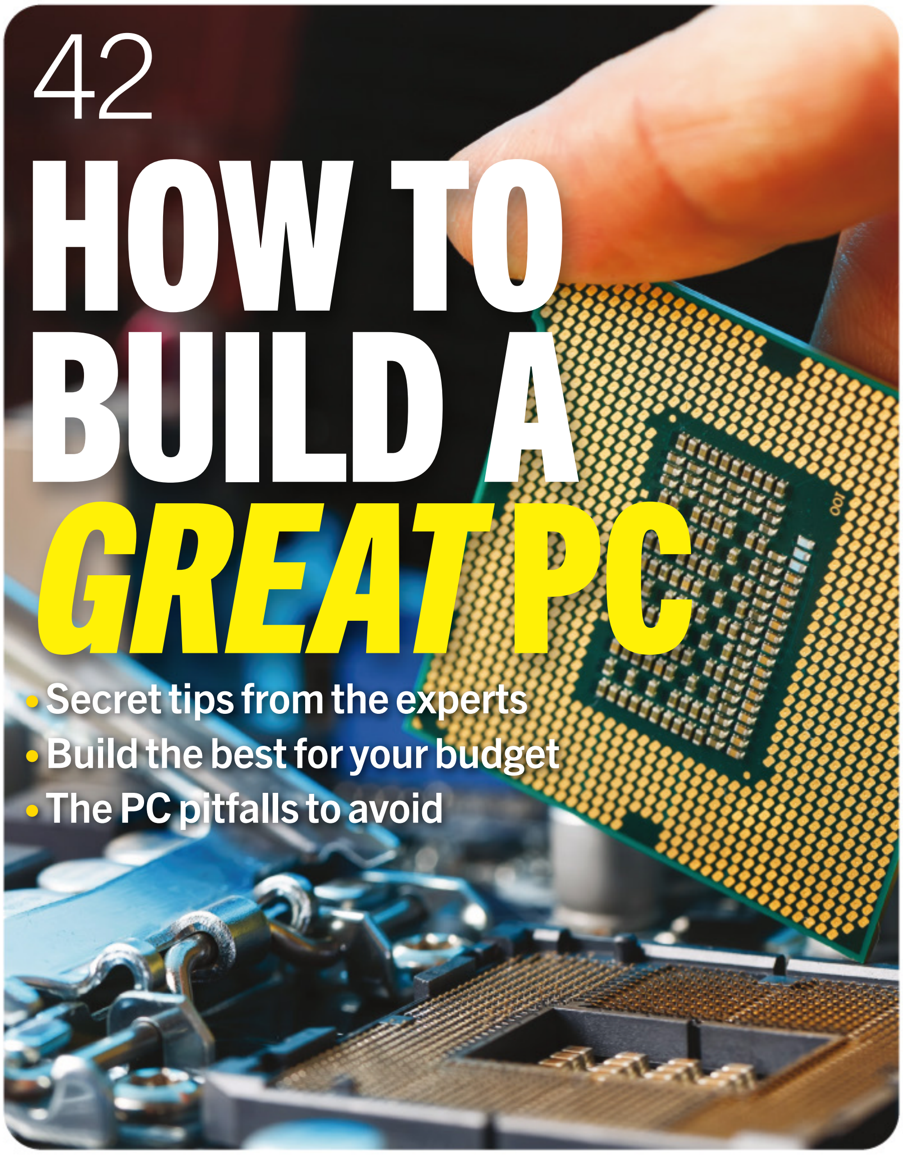

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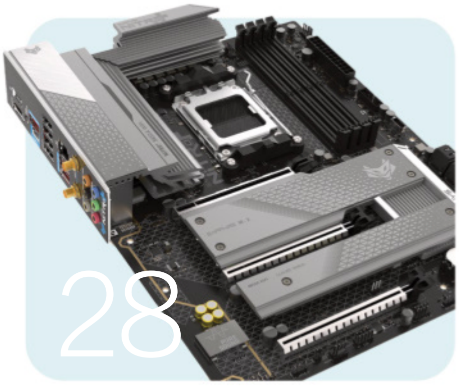

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Commodore

COMMODORE 64 ULTIMATE ECLIPSES 10,000 UNITS SOLD ALREADY

Rebooted firm gives huge thank you to fans.

The new, reinvigorated Commodore has announced that its maiden product reached a significant milestone. The official Commodore account on X shared evidence that the Commodore 64 Ultimate had eclipsed the 10,000 units sold milestone. The statement also offered profuse thanks to the community. Retro computing fans should be cheered by this latest Commodore milestone, even if they aren't particularly interested in experiencing a modern C64. Remember, the new Commodore has quite boldly claimed that it will become a "Founder's Sandbox," for new computer tech projects. Its roadmap will feature as many as 12 major releases over the next four years – which should be exciting for all computer enthusiasts. Pricing starts at $452 via **www.commodore.net**.

JAPANESE CITY IMPLEMENTS DAILY SMARTPHONE USAGE LIMIT

Two-hour limit applies to usage outside work and study purposes.

A draft ordinance that proposes a limit of two hours of smartphone use, outside of work or study purposes, was voted on in Toyoake City, Aichi Prefecture, Japan. "Toyoake City says that smartphones are essential for daily life, but prolonged use may affect the home environment, such as lack of sleep, and may hinder the healthy growth of children," reports NHK. Children of school age should follow additional advice to put down their devices by 9 pm if at elementary school or younger, and by 10 pm if a junior high school student or above. Mayor Masanori Kouki mused that it would be useful if citizens checked themselves for health and sleep benefits after making changes to their leisure time smartphone habits.

NVIDIA
intel.

Intel, Nvidia

Nvidia buys $7.5 billion in Intel stock in seismic deal

Both companies were working in secret on jointly developed processors for a year.

In a surprise announcement that finds two long-time rivals working together, Nvidia and Intel have announced that the companies will jointly develop multiple new generations of x86 products together – a seismic shift with profound implications for the entire world of technology.

The products include x86 Intel CPUs tightly fused with an Nvidia RTX graphics chiplet for the consumer gaming PC market, named the 'Intel x86 RTX SOCs.' Nvidia will also have Intel build custom x86 data centre CPUs for its AI products for hyperscale and enterprise customers. Additionally, Nvidia will buy $7.5 billion in Intel common stock at US$23.28 per share, representing a roughly 5% ownership stake in Intel.

Given the traditionally long lead-times for new processors, it is rational to expect these products will take at least a year, and likely longer, to come to market.

Nvidia emphasised that the companies are committed to multi-generation roadmaps for the co-developed products, which represents a strong investment in the x86 ecosystem. But Nvidia representatives tell us it also remains fully committed to other announced product roadmaps and architectures, including the company's Arm-based GB10 Grace Blackwell processors for workstations and the Nvidia Grace CPUs for data centres, as well as the next-gen Vera CPUs.

Nvidia hasn't disclosed whether it will use Intel Foundry to produce any of these products yet. However, while Intel has used TSMC to manufacture some of its own recent products, its goal is to bring production of most high-performance products back into its own foundries.

For the PC market, the Intel x86 RTX SoC chips will come with an x86 CPU chiplet tightly connected with an Nvidia RTX GPU chiplet via the NVLink interface. This type of processor will have both CPU and GPU units merged into one compact chip package that externally looks much like a standard CPU, rivalling AMD's competing APU products.

Intel's new x86 RTX CPUs will compete directly with AMD's APUs. For AMD, that means it faces intensifying competition from a company with the leading market share in notebook CPUs (Intel ships ~79% of laptop chips worldwide) that's now armed with GPU tech from Nvidia, which ships 92% of the world's gaming GPUs.

Intel, Nvidia

EA

EA strikes a $83 billion deal to go private

Trump's son-in-law and Saudi-backed takeover.

Electronic Arts has announced that its plans to go private have gone ahead. A consortium that includes Saudi Arabia's Public Investment Fund and Trump son-in-law Jared Kushner's Affinity Partners, alongside the private equity firm Silver Lake, has snapped up EA in a $83 billion deal.

The $83 billion deal also now cements EA as the biggest ever leveraged buyout, usurping the $68 billion buyout of Texas utility group TXU in 2007. For reference, a leveraged buyout is when a private equity firm uses a large amount of borrowed money to finalise the deal, with what is to be acquired used as collateral in the debt, effectively leaving the bought-out company liable for the debt. The company's future income will be used to repay the debt over a period of time. In this instance, $30 billion of the financing for the buyout comes via a loan from JPMorgan.

The news comes amid a string of successes for EA. Having just released a well-received *FC 26* that delivers a huge overhaul to the core game mechanics, while also gearing up for perhaps the most anticipated FPS this year, *Battlefield 6*.

QUALCOMM'S NEW SNAPDRAGON X2 ELITE EXTREME AND X2 ELITE

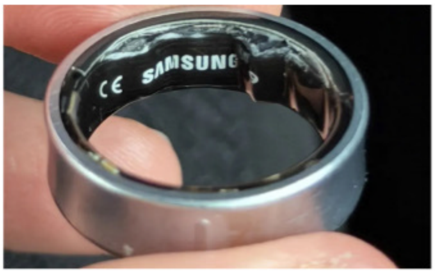
PCs with the chips are scheduled for the first half of 2026.

Qualcomm is back for round two of its push into Windows PCs. The company revealed its Snapdragon X2 Elite and X2 Elite Extreme. These chips will serve as the high-end offerings in Qualcomm's second generation of Arm-based chips for laptops and other PC form factors.

The Snapdragon X2 Elite Extreme will offer up to 18 cores, and Qualcomm claims it's the first Arm chip to hit 5GHz (on up to two cores).

The Snapdragon X2 Elite uses a mix of Qualcomm Oryon Prime cores and what it calls Performance CPU cores. At normalised power, Qualcomm says it offers up to 75% more performance than its competitors.

In multitasking, it claims the new chips will offer up to 31% faster performance at a normalised ISO power, while needing 43% less power than last-gen processors.



Daniel Rotar/X

GALAXY RING OWNER HOSPITALISED AFTER IT SWELLS

'Won't be wearing a smart ring ever again'.

The battery in a Samsung Galaxy Ring has reportedly swelled so much that it became stuck on an owner's finger, making it impossible for him to remove by himself. The swollen ring was reported by YouTuber and tech influencer Daniel Rotar of *ZoneofTech*. He shared photos of the malfunctioning ring with a visible bulge and separating interior layer on his finger.

Samsung sent *Tom's Guide* a statement saying that cases like Rotar's are extremely rare. "The safety of our customers is a top priority. While experiences like this are extremely rare, there are a few ways to attempt removing a stuck ring, including soap and water – or submerging your hand in cold water," the statement reads.

THE AI TOOLS THE CEO OF NVIDIA USES

Ever wondered what Jensen Huang uses himself?

Nvidia CEO Jensen Huang has revealed some details about his personal usage of AI tools, including which particular systems he prefers. "It's like working with someone who has known you for a long time – when you use a word processor or spreadsheet, every time you use it, you're starting from zero - and yet the way you work with people isn't like that!" Huang told *TechRadar*.

Asked about which specific systems he used, Huang listed Gemini, Grok, and ChatGPT 5, noting he used different systems for different tasks. This includes using Gemini for things that are "a bit more technical", whereas he uses Grok for "more artistic" tasks, Perplexity for "fast information access", and finally, "for near-everyday use, I really enjoy using ChatGPT."

Where the data goes

AI cloud companies have guzzled up so much HDD storage that they might be coming for our SSDs next.

Oh the times they are a-changin'. A few years ago, I don't think I'd have predicted that HDDs, of all things, would be selling out, but here we are. According to global market intelligence and consulting firm TrendForce's investigations, "nearline" HDDs are "facing severe supply shortages", which is pushing cloud providers towards QLC SSDs.

Nearline HDDs are ones used for infrequently accessed data, acting neither as cold (long-term) nor hot (rapidly accessible) storage but something in between. They're primarily used for data such as backups. The AI boom has meant there's more of this storage in demand than before, to keep previous AI training data and model roll-backs, for instance.

One recent example of this increased demand comes from Western Digital. The company recently split from its SSD arm, Sandisk, to focus entirely on HDDs. TrendForce relays a notice from the company that was "spotted by industry sources" and explains that there is "unprecedented demand for every capacity in our portfolio."

Consequently, WD "will be gradually implementing price increases on all HDD products, effective immediately." It will also expand its "use of ocean freight", which will increase transport time by a few weeks but "significantly reduces emissions compared to air transport."

If a few weeks seems a long time, you're perhaps not understanding the scale of the demand, as TrendForce explains that "lead times for high-capacity HDDs have now extended to nearly one year." I suppose a few extra weeks isn't too much extra.

Given there seems to be no letting up on the AI freight train, CSPs might not be content waiting so long for HDDs and might therefore start buying up QLC SSDs.

These SSDs are of course faster than HDDs, and they also consume less power, but they cost more. They're not as fast as your average consumer SSD today, though. 'QLC' means 'quad-level cell', which means they can store four bits of information in each flash cell. Most of the best SSDs for gaming or general use that you'll find will be TLC ('triple-level cell') SSDs that are faster than QLC ones and tend to last longer, too.

It's worth noting that that might change, though, as we're seeing talk of some pretty impressive improvements to QLC storage. It could be that some future QLC SSDs will be quick enough (and remain cheap enough) to be great value propositions for users.

Current QLC SSDs, though, are certainly a next-best bet for large collections of warm storage, if high-capacity HDDs aren't available. TLC is unnecessarily fast and expensive when QLC is on the market.

As such, there shouldn't be a direct impact on storage for consumer SSDs such as the ones we slot into our gaming rigs. But the key word there is "direct", because if the component and chip market in 2025 has shown us anything, it's just how connected market effects are. For instance, if storage companies start gobbling up QLC SSDs for warm storage, others who were using QLC SSDs for hot storage might shift to TLC, causing those stocks to shrink, too.

The other side of the coin, of course, is that more money being poured into SSDs rather than HDDs could mean more resources are put into flash storage and SSD production. Though it would presumably take a while for us to see the effect of that increased production capacity.

In the short term, I'd place my bets on less SSD stock and higher prices, though hopefully it being restricted to QLC NAND will mean it doesn't affect our PC and laptop storage too much for now.

Jacob Fox ■

"It could be that some future QLC SSDs will be quick enough (and remain cheap enough) to be great value propositions for users."

© Getty

Agentic AI

Are you ready for AI bots to start actively working in your business?

Not another sort of AI — is there no end to them?

None in sight yet! And while not all AI-related "innovations" are actually distinct and useful, agentic AI does deserve a label of its own.

To define our terms, "agentic" refers to the pre-AI concept of an agent – a piece of software that acts automatically, without requiring a human to click its buttons. Early agents usually took care of simple tasks such as installing updates or blocking viruses, following fixed rules or instructions beamed over the network, but the new generation of AI agents are far more autonomous. They can use multi-step reasoning, act proactively and improve based on past experience.

So the AI just decides for itself what to do?

Not exactly: AI agents are usually tailored to specific tasks. One popular type is customer support agents, which can answer questions and give advice in a conversational manner. Other types of agent can keep watch over network security, manage production lines or pursue scientific research with a speed and persistence that few lab assistants can match.

This sounds like something you know a lot about!

Well, this is a hot topic for me, and for all IT professionals. Although we've been hearing for years about how AI is going to take our jobs, the likes of ChatGPT and Microsoft Copilot are more about improving a person's productivity than replacing them altogether. Agentic AI, however, has the potential to completely upend employment practices, allowing businesses to eliminate entire employee functions and delegate them to software.

What makes agentic AI so different to regular AI?

It's not just that agentic AIs are designed to do a particular, practical job: the idea is that they'll do it to somewhat professional standards. It's considered good enough for a general-purpose LLM such as ChatGPT to operate as an opaque "black box" and generate output that's plausible if not entirely accurate. Agents, however, are (or should be) held to higher, more tightly defined standards. One particularly desirable characteristic is that the decision-making process comes with a descriptive log, allowing humans to review the machine's "thoughts" processes – providing an element of, if not accountability, then at least visibility.

Why has it taken so long for agentic systems to start catching on?

Good question. While ChatGPT has been with us for nearly three years, agents are only now gaining attention. This is partly because the idea of allowing a piece of code to directly control a real-world system, with no direct human oversight, makes lots of organisations understandably uneasy. There's also the practical issue that there isn't currently a standard interface for AI to control all our different technology systems, so you may not be able to easily deploy a neatly packaged AI agent into your existing IT portfolio – although you could always build one yourself.

How can I trust an AI that can learn and change its own behaviour?

Another good point. Any job worth doing needs to be done with a certain consistency, and this is something AI has traditionally been poor at. But if AI agents provide justifications for their autonomous decisions, we can use those to guide them. They may also give us workflow insights that we'd never have picked up from human staff – which can in turn drive results that, if not wholly consistent, consistently improve.

Steve Cassidy ■

"Although we've been hearing for years about how AI is going to take our jobs, the likes of ChatGPT and Microsoft Copilot are more about improving a person's productivity than replacing them altogether."

Intel x Nvidia collaboration

Intivia, Nvintel, Nvidtel? Whatever this celebrity couple's name is, Mark Williams knows it'll be making headlines for years to come.

A seismic announcement was made by Nvidia and Intel during a recent press conference. The two companies will be working together to create both datacentre and client products going into the future. To cement the deal, Nvidia is buying some US$5B worth of Intel stock and becomes the third largest single voting shareholder.

There are multiple factors at play here that have coalesced into this partnership making sense for both parties.

> "Nvidia has been wanting its own CPUs to compete in the laptop market on its own for a long while now, but ARM CPUs aren't where the client PC masses are – it's in x86."

Primarily for Nvidia's bottom line the growth is being powered by AI datacentre products, where it's been relying on custom in-house designed ARM (Grace) CPUs to co-package with its datacentre offerings. This has frustrated hyperscalers as it limits them to one CPU IP. Back in May, Nvidia announced NVLink Fusion in partnership with Qualcomm and Fujitsu, which allows for any ASIC or CPU to be co-packaged with Nvidia's datacentre GPUs. This collaboration enables Intel to create custom x86 CPUs for Nvidia with NVLink interconnects, providing Nvidia's customers with more choices.

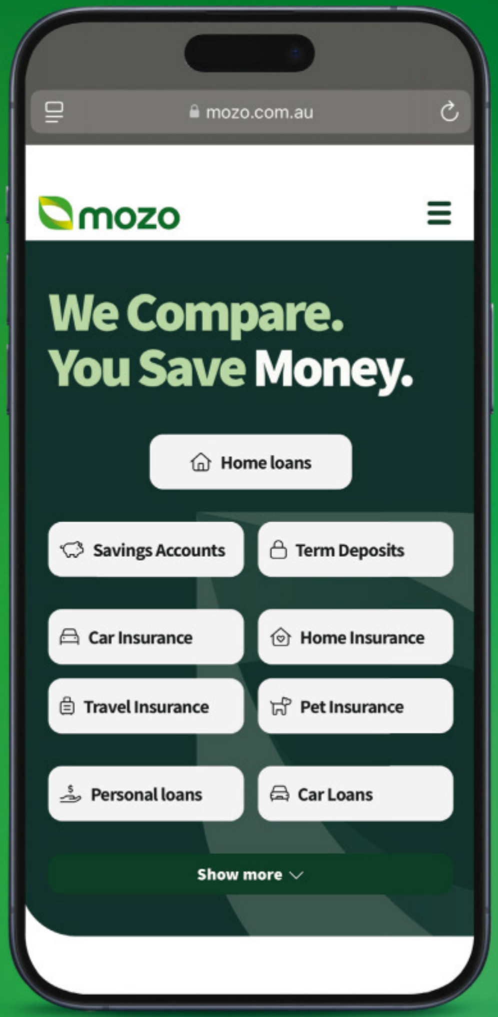
Secondly for Nvidia, is the laptop market. Nvidia's CEO Jensen Huang said, "There is an entire segment of the market where the CPU and GPU are integrated, and it's for form factor, battery or cost reasons, and that segment has been largely unaddressed by Nvidia today." Nvidia has been wanting its own CPUs to compete in the laptop market on its own for a long while now, but ARM CPUs aren't where the client PC masses are – it's in x86. This deal effectively gives Nvidia access to an x86 license and the advanced packaging required to make that happen, via Intel.

Like Kaby Lake-G, which was, then, an unfathomable APU that was designed by Intel with an AMD graphics chiplet, this collaboration should see a similar situation, just with an Nvidia GPU. Internal leaks from Intel report that Hammer Lake designs had started to be redefined recently, "to get some new large and powerful iGPU with a 2029 release date". Hammer Lake is four generations down Intel's roadmap. In the meantime, Intel will be using its upcoming "Celestial" Arc architecture to tide it over for the next few years. This gives AMD, particularly with its Strix Halo-based offerings, a few more years to capture market share before Nvidia-backed products arrive.

For Intel, this largely represents a desperately needed cash injection as well as ensuring that its CPU IP remains relevant in the ultra-lucrative datacentre space. This deal may have come at the cost of its Arc GPU architecture, though, as while Intel said this won't affect its roadmap or GPU offerings, Intel notably didn't specify that Arc would continue either. With sources from within Nvidia leaking that Nvidia will be "making Intel's future iGPU tiles", it's beginning to sound very bad for Intel's Arc division, and with it, consumers' hope of a proper third GPU player in the market.

Jensen Huang seems to have played a masterstroke here, taking advantage of Intel's recent weakness to simultaneously improve Nvidia's AI offerings and potentially killing off the third GPU competitor before it fully takes root, all the while creating an opening for itself in the laptop APU market that it never had before, further increasing its product reach. ■

Mark Williams is an IT professional with a strong interest in voiding warranties.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Electronic Arts isn't dead, but it's dying

Following a leveraged buy-out by Saudi Arabia and Jared Kushner's investment firm, EA's creative prospects are dim.

For the videogames industry, the theme of this decade has been seismic change on a scale that would have seemed unfeasible at the turn of the century. Whether it's Microsoft buying Activision, the ascent of China and Korea's blockbuster development prowess, or the buckling of the western blockbuster market, it's fair to say that 2025 feels dramatically different to 2015, and like an alternate reality compared to 2005.

Founded in 1982, Electronic Arts is hardly the brand it used to be outside of sports and *The Sims*, but it's second only to Activision in terms of American games companies with longevity and widespread awareness. If you've lived long enough, you probably saw Electronic Arts' logo appear when booting up games for the Commodore 64, Atari ST, Amiga, Apple II and PC back in the '80s. You can thank them for *SimCity*, *Syndicate*, *Road Rash*, *System Shock* 2… the list goes on.

EA was a huge concern for most of its long history, but it's struggled to make any impression in the 2020s. Relying on its annualised EA Sports titles, *The Sims* and – to a lesser degree – *Apex Legends*, its attempts to extend beyond these cash cows have largely floundered. 2024's *Dragon Age The Veilguard* was a commercial and artistic failure for EA's BioWare, while other more traditional single-player action games like *Immortals of Aveum* and *Wild Hearts* have struggled to make a dent in the market. Exceptions include *Split Fiction* and the *Star Wars Jedi* games, but these have the whiff of something from antiquity when we look at what Electronic Arts – and most other major "heritage" American games companies – is making its money from nowadays. Still, with *Battlefield* 6 just around the corner at time of writing, the second half of 2025 was looking pretty positive for EA.

If this has the whiff of a eulogy about it, it's because last month Electronic Arts went private and was sold for US$55 billion, pending regulatory approval, to a consortium including Saudi Arabia's Public Investment Fund, Silver Lake, and Affinity Partners, an investment firm founded by former Trump senior advisor Jared Kushner (he's also, in case you forgot, Trump's son-in-law). It was a leveraged buyout, which means funds for the purchase were borrowed, with the purchased assets serving as collateral.

It's part of Saudi Crown Prince Mohammed bin Salman's efforts to transform Saudi Arabia into a "global hub for games and esports" by 2030. PIF's prints are all over the industry, including a more than 8% stake in Nintendo, ownership of SNK, 3.5% of Take-Two (which includes 2K and Rockstar) and 5% stakes in both Nexon and Capcom. The list goes on (and on). Before this new buyout, PIF already owned 10% of EA.

Saudi Arabia's human rights abuses are well-documented. Human Rights Watch reports that the regime has executed "at least" 241 people already in 2025, while Amnesty International notes its propensity for "arbitrarily detain[ing] individuals without giving them any opportunity to challenge the lawfulness of their detention". Prince Mohammed has been accused by US intelligence of the 2018 assassination of Washington Post journalist Jamal Khashoggi.

Are Prince Mohammed and Kushner – among other figureheads in the buyout – likely to nurture whatever creative talent is left at EA? In an internal memo released shortly after the buyout announcement, EA CEO Andrew Wilson wrote that "[This] moment is a recognition of your creativity, your innovation, and your passion." Honestly, that has the whiff of a eulogy about it too. ■

Shaun Prescott is an Australian editor for PC Gamer and GamesRadar, and writes for APC, TechRadar and more.

The economics of AI

The AI bubble is expanding so fast it must surely burst.

Everyone on the internet appears to be outraged about something. You can't move for social media postings lambasting some new cause or public issue. And yet many of these postings have little or no source referencing, and if they do, it's to a site whose information integrity is often, shall we say, somewhat lacking.

A claim I read recently is that you should delete unnecessary photos on your mobile device, because these are being backed up to one of many cloud storage facilities. And all of those pictures require storage, and that consumes power. Well, this is entirely true, but it must be put into context. Just what proportion of the energy consumption is related to those baby photos you took when your offspring first started to walk?

> "Is this a race to the bottom, where only the companies backed by the deepest pockets can hang on long enough to pay the power bills, build the data centres and fill them with extraordinarily expensive hardware?"

But still, the question arises about how much processing power is required to support the huge data centres that are being built by the big AI players. Some are claiming that all sorts of exotic power generating systems can be used, from vast solar panel arrays to small scale nuclear reactors.

It is far from clear that this enormous rush to build ever-larger AI farms will be met with appropriate power facilities to feed them, or whether the local networks will be brought down. Or the prices of wholesale electricity go up in price to match the demand.

But will it all be necessary anyway? Is this a vast bubble that is about to burst? I read this post on X last week: "Why AI is a house of cards: You pay $200 a year for an AI app (like Cursor). Cursor pays OpenAI $500 for API tokens ($300 of which is VC funding). OpenAI pays AWS $1,000 for compute ($500 of which is VC funding). $AWS pays $10k for $nvda GPUs. See the problem?"

Now I am not proposing that the figures are accurate, but there is an underlying truth here. None of this infrastructure can make money at the moment. It isn't an issue of "we will break even when we can scale out enough". The costs just continue to go through the roof. And adding in newer and faster generations of technology from Nvidia might seem like a good solution, but not if the workload is increasing at a rate that can consume every clock cycle that you throw at it.

Is this a race to the bottom, where only the companies backed by the deepest pockets can hang on long enough to pay the power bills, build the data centres and fill them with extraordinarily expensive hardware?

It feels like a game of Russian roulette played out by the biggest companies on the planet. When the music stops, and the money runs out, the fall-out will be quite devastating. Or have we got to a point where these companies are simply too big to fail?

At some point, these enormous AI factories have to come up with a business model that actually works. In 2024, OpenAI lost $5 billion on revenue of just under $4 billion. But this is small fry: Google, as Alphabet, is spending $85 billion in 2025, up from initial estimate of $75 billion, on AI and other related technical infrastructure work. And I have read that Microsoft is spending $80 billion in 2025 too.

At some point, this all adds up to a lot of money. Will the music stop soon? ■

Jon Honeyball is neither artificial nor intelligent.

GADGETS

Nice things to have

The Antigravity A1 drone is equipped with four propellors and weighs just 249g.

Antigravity A1

PRICE $TBC **WEB** antigravity.tech

Described as the world's first 8K 360 drone, the Antigravity A1 has everything you need to create amazing aerial footage in glorious Ultra HD video quality. Available from January 2026, the Antigravity A1 comes in three parts: the A1 Drone, which can shoot footage forwards, backwards, above and below all at the same time; the Grip Motion Controller, which promises to make flying easy, even for newbies; and the Vision Goggles, which enables you to see exactly what the drone sees.

Created by Insta360 – the same people responsible for action cameras such as the new GO Ultra – the A1 seamlessly stitches together the scenes it captures from each of its cameras, both when viewing live and when editing later, and you can choose exactly what you want to see – so if you want rear-facing clips of the drone soaring upwards, the sky's the limit!

The Vision Googles give you the perfect viewpoint through which to see live Antigravity A1's 8K 360 footage.

Elipson Horus 6B Active BT

PRICE $1,199 **WEB** en.elipson.com

With a history that stretches back to 1938, French brand Elipson knows a thing or two about making great audio – which is why the arrival of the Horus Active BT is so enticing. Equipped with Bluetooth 5 as well as a USB Audio port, this speaker pair should be instantly recognised by your PC or laptop and is ideal for enjoying music and games, and is a great choice for editing. They even have a built-in phono stage, so you can use them with a vinyl turntable as well. Zut alors!

This bookshelf speaker pair should instantly connect to your PC.

PRICE $TBC **WEB** benq.com

BENQ PV3200U

Aimed at both creative pros and 'YouTubers' (whatever they are), the BenQ PV3200U is a great go-to for the next time you need to edit video. This 32-inch 4K display only needs a single USB-C port for both connection and power, and meets 100% of the Rec.709 and 95% of the DCI-P3 colour gamuts. Like other BenQ 'creative' displays, the PV3200U includes a Hotkey Puck for easy tweaking of the display's settings, and features BenQ's own M-book Mode for easy colour matching with your PC. And its stand has tilt, swivel, pivot and height adjustment.

PRICE $463 **WEB** plaud.ai

PLAUD NOTE PRO

New from the makers of the NotePin, the Plaud Note Pro promises to make following up meetings easier – by doing the hard work of transcription for you. Around the size of a credit card, the Note Pro is able to do this thanks to the power of artificial intelligence (AI), and comes with 64GB of onboard storage for voice recordings, which are captured using its four microphones. Offering up to 75 days of battery life on standby, the Plaud Note Pro should also be ready and waiting for the next time you're hauled in front of the boss.

PRICE $469 **WEB** owc.com

OWC EXPRESS 1M2 80G PORTABLE SSD

This USB4 solid-state drive (SSD) has a 'build your own' vibe to it – giving you the ability to buy the enclosure only (so you can add your own storage) or fill it with 1TB, 2TB, 4TB or 8TB of M2 storage at buying time. Its palm-sized aluminium body is equipped with fins so your files can cool their heels, with speedy data transfers of up to 6,000MB/s possible via its Thunderbolt 5 compatible port. Ideal for anyone who needs high performance, the drive is bus-powered with a USB4 cable included.

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REVIEWS

Expert reviews and recommendations to help you buy with confidence

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APC is Australia's oldest consumer technology magazine – having been consistently in print for over forty years, since our first issue way back in May 1980 – and we take that heritage and responsibility very seriously. While our focus is obviously on the personal computer the very definition of the PC has changed and shifted markedly since the early 1980s.

As such, we touch on many other areas of everyday tech, too, from smartphones and apps to peripherals, accessories, and beyond. We have two goals: to find the best modern tech and to help you make the most of it.

INDEPENDENT REVIEWS

Championing technology doesn't mean we're unrelenting yes-men and -women, however, and *APC* aims to be as objective as possible in all our coverage. That means identifying the best products from multiple perspectives – the best performance, best value and best features and, ideally, the products that offer the best mix of these three attributes.

As a matter of policy, reviews published in *APC* are not shared with product-makers prior to print. We will contact vendors under certain conditions; for example, if we have a problem testing a product that seems to indicate it may be faulty, or to invite a vendor to clarify how a particular feature works. If an *APC* reviewer has any potential conflicts of interest involving a brand, the review will always be assigned to another writer.

LABS TESTING

APC strives to conduct the most rigorous, objective scientific tests and benchmarks we can so as to make our reviews as unbiased as possible. We use a variety of tools and programs for this, including many freely available benchmark suites for assessing media encoding, general system performance including storage read and write speeds, gaming and battery life.

APC EDITOR'S CHOICE

When a product scores 4.5 out of 5, it carries the Editor's Choice Award. These are products that exceed expectations and deliver a quality experience up there with the very best.

APC HIGHLY RECOMMENDED

You will see this award if a reviewed product has scored four out of five stars. It means most people can expect satisfying performance from the product, and that we would use it ourselves.

PRICE $5,888 **WEB** tinyurl.com/APC551ROGNUC

Asus ROG NUC 15JNK

Asus' second-gen ROG Gaming NUC aims to be a well-timed third option for those seeking a new laptop or desktop.

ROG NUC
REPUBLIC OF GAMERS
EST 2006
apc
EDITOR'S CHOICE

With Windows 10 deprecation at our doorstep, discussion amongst those farewelling trusty-old PCs (and new buyers) has revolved around whether to purchase a new desktop or high-powered laptop computer. But, Asus posits an attractive third option: the ROG NUC.

Now in its second generation, the 2025 NUC is a unique, highly engineered hybrid-desktop PC with bespoke chassis, motherboard and cooling technologies, plus high-end, gaming-laptop silicon. Its announcement drew criticism for the high price but if one diminutive device can negate buying a massive, hideously expensive desktop or desktop-replacement laptop (that's going to take up significant room on your desk) the value could be high.

First up, it looks great with its geometric fins and flourishes aping hyper cars for form and function. The RGB ROG logo adds flair and only the printed gamer slogans might prove divisive.

A single thumbscrew facilitates easy access to the internals where you can swap-out two SODIMMs and populate the spare PCIe Gen 5 NVMe 2280 slot. Our review unit came with 32GB of DDR5-6400 RAM, an integrated 1TB NVMe PCIe 4 drive plus an Intel Core Ultra 9 275HX processor and a laptop-grade Nvidia GeForce RTX 5080 GPU (with 16GB of GDDR7 RAM). That's some serious power in a chassis that measures just 282 x 188 x 57mm and so Asus utilises a large bespoke vapor chamber cooler, two special 'dual-blower' processor fans and a case fan to expel heat and promote stability.

Its PCMark 10 score of 8,842 demonstrates high proficiency with general computing tasks (as do its Geekbench 6 scores). It's Cinebench scores show can handle regular processor-based rendering tasks. Its 3DMark CPU Max threads score of 15,871 underlines the prowess of the processor's eight Performance and 16 Efficient cores that operate between 2.1 and 5.4GHz.

Its 3DMark scores show it's a capable gaming machine. I also played *Doom: The Dark Ages* at 4K at over 200fps. It's a great gaming PC. Trading blow for blow with the Alienware 16 Area-51 we recently reviewed (*APC* 550, score 3.5/5), the differences in performance with the otherwise identical CPU and GPU are only a reflection of more recent drivers used with the ROG machine.

The fans can ramp up to a robust whoosh when under load, but you can use Asus' Armory Crate app to reduce noise when needed.

The NUC can support five 4K displays via connectivity that includes one Thunderbolt 4, two DisplayPort 2.1 and two HDMI 2.1 ports. There are also six USB-A 3.2 Gen 2 (plus, one type-C) ports, a 3.5mm audio jack and 2.5GbE LAN. Wi-Fi 7 and Bluetooth 5.4 are integrated.

Ultimately, the 2025 ROG NUC performs like a modern, top-tier, 16-inch gaming laptop and costs similar at $5,888. It's much cheaper than 18-inch desktop replacement laptops. Traditional Desktop PC builders may hate it but this high-performing portable/stowable pre-built gaming PC can also be transported easily (and hot-desked). Its fast connectivity suits data storage on a NAS. It's perfect for those who don't want a laptop or desktop on their desk anymore. ■

VERDICT

★★★★★

The NUC is an expensive (but also very good value) gaming desktop-laptop-hybrid that will suit many gamers and power users.

NICK ROSS

BENCHMARK RESULTS	Asus ROG NUC 15JNK	Alienware 16 Area-51
CPU	**Intel Ultra 9 275HX**	**Intel Ultra 9 275HX**
GPU	**RTX 5080**	**RTX 5080**
RAM	**32GB**	**32GB**
Street Price	$5,888	$5,540.00
PCMark 10 - Overall (score)	**8,842**	8,639
Geekbench 6 - Multi-core	18,721	**20,244**
Geekbench 6 - Single-core	3,048	**3,149**
Geekbench 6 - GPU	212,120	**213,178**
Cinebench R24 - CPU Single Core	**134**	133
Cinebench R24 - CPU Multi Core	1,946	**2,106**
3DMark SpeedWay	**5,761**	5,610
3DMark Port Royal	**12,209**	11,999
Steel Nomad	**5,249**	5,109
Cyberpunk 2077 - 1600p RT Low (DLSS)	**122**	114
Cyberpunk 2077 - 1600p RT Low (No DLSS)	**82**	79
Cyberpunk 2077 - 1600p RT Ultra (DLSS)	**80**	72
Cyberpunk 2077 - 1600p RT Ultra (No DLSS)	**40**	37
Black Myth Wukong - 1600p Cinematic	**105**	104
Shadow of the Tomb Raider 1600P DLSS Off	**176**	175
CrystalDiskMark Read/Write (MB/s)	**6,852**	6,575
CrystalDiskMark Read/Write (MB/s)	**6,410**	5,890

SPECS Mini gaming desktop PC. Intel Core Ultra 9 Processor 275HX; Nvidia GeForce RTX 5080 Laptop GPU; 32GB DDR5-6400 RAM; 1TB NVMe PCIe Gen 4 drive; 6x USB-A 3.2 Gen 2 ports, 1x USB-C 3.2 Gen 2, 1x Thunderbolt 4, 2x DP 2.1, 2x HDMI 2.1, 1x 3.5mm audio jack. 2.5GbE LAN; Wi-Fi 7, Bluetooth 5.4; 282 x 188 x 57mm, 3.12KG.

PRICE $TBA **WEB** acer.com

Acer TravelMate P4 Spin 14

A flexibility business 2-in-1 for those who want something a little bit different.

This month we got hands-on with Acer's TravelMate P4 Spin 14, running the 2025-launched Intel Core Ultra 7 255U – a mid-range CPU aimed at office workflows that include lighter creative tasks and frequent multitasking. Our configuration includes 64GB of DDR5 RAM, but the Spin 14 also stands out with 2-in-1 flexibility that lets it operate in tablet and tent modes (with a pen) for sketching and meetings.

Sure, it's not the slimmest or the most eye-catching, but you get a sturdy build that includes practical touches that will be appreciated in daily use. Our unit has an excellent 14in 2880 x 1800 IPS touchscreen rated at 340 nits brightness and 100% sRGB, but be aware that some variants have a lesser 1920 x 1200 touch panel.

On the left you get dual USB4 (with charging and DisplayPort), USB-A 5 Gbps and HDMI, while the right has USB-A 5 Gbps, RJ-45, 3.5mm audio and a Kensington lock port, plus a handy microSD slot on the front. Connectivity is up to date with Wi-Fi 7 and Bluetooth 5.4 plus a microSD slot and a Gigabit Ethernet jack. It pairs both IR facial recognition and a fingerprint reader for logins, plus offers a physical camera shutter and discrete TPM (Trusted Platform Module) for business needs. You also get an Active Stylus for notes and sketches that tucks neatly into a slot in the side of the laptop.

The build quality is robust, with little flex or bounce, though the 1.89cm thickness feels chunky compared to productivity machines that are usually closer to 1.6cm. The backlit keyboard and responsive touchpad are comfortable to use for extended periods. The design of the 360-degree hinge is excellent, and the laptop is easy to switch between modes and use as a tablet.

The Ultra 7 255U delivers solid performance in productivity tasks and handles multithreaded workloads well, so spreadsheets, photo tweaks and an ever-increasing number of browser tabs are handled just fine. Single-thread speed is decent, but not standout, though the 64GB of memory really helps make the machine feel snappier and more capable when running a lot of different applications. The Ultra 7 255U CPU uses fairly basic Intel integrated graphics, and while not as powerful as the excellent Arc 140V options, it's still more than good enough. The cooling system keeps the temps in check under sustained loads, though it can get fairly noisy when running flat out.

In a welcome move, the TravelMate has upgradable RAM, so it can be kept relevant for longer. The Ultra 7 255U also includes a 12 TOPs NPU, which can help with some Copilot features, but does not meet the 40 TOPs needed for CopPilot+ and AI specific workflows.

The laptop has a smallish 53Wh battery and charges fast from the 100W USB-C power adapter. Acer rates battery life at up to 17 hours depending on tasks and settings, but we only managed just under 11 hours for watching video, and under 8 for actual work, so don't expect to handle a long day without a charger. ■

BENCHMARK RESULTS	Acer TravelMate P4 Spin 14	Acer TravelMate P6 14 (2024)
CPU	**Ultra 7 255U**	**Intel Core i5-1335U CPU**
GPU	**Intel integrated graphics**	**Intel Iris Xe graphics**
RAM	**64GB**	**16GB**
Battery Capacity	**53Wh**	**65Wh**
RRP	**$TBA**	**$2,299**
PCMark 10	**5,648**	4,984
Cinebench R24 - CPU (multi-threaded)	**540**	510
Cinebench R24 - CPU (single-threaded)	**110**	99
Geekbench 6 - Multi-core	**9,147**	9,121
Geekbench 6 - Single-core	2,084	**2,183**
Geekbench 6 - GPU	**20,536**	12,132
CrossMark	**1,428**	1,157
3DMark Time Spy	**2,414**	1,291
3DMark Night Raid	**19,916**	14,529
Battery life - 1080p video playback (h:min)	10:43	N/A
CrystalDiskMark Read (MB/s)	**4,768**	4,512
CrystalDiskMark Write (MB/s)	3,635	**3,788**

SPECS W11 Pro; 14in, 2.8K (2880 x 1800) IPS; Intel Core Ultra 7 255U CPU, Intel Graphics iGPU; 64GB DDR5 RAM; 1TB SSD; 53Wh battery; 31.29 x 23.48 x 1.89 cm; 1.43kg

VERDICT

★★★½☆

A compact yet capable business 2-in-1 that stands out for its flexible design and solid performance, but battery life is a little disappointing.

LINDSAY HANDMER

PRICE $2,750 **WEB** dell.com

Dell Pro 13 Premium

A compact business laptop with solid mid-range performance.

apc HIGHLY RECOMMENDED

Aimed at professional users, the Dell Pro 13 Premium is a compact business laptop that's well matched to typical workplace use where battery life matters more than raw performance.

Our review configuration pairs an Intel Core Ultra 5 238V with 32GB LPDDR5X and a 512GB NVMe SSD, while the cheaper variant uses a Core Ultra 5 236V with 16GB. There's also a more powerful (and expensive) Ultra 7 268V model. The Ultra 5 iGPU is an Intel Arc 130V, which suits productivity work and light creative tasks without the heat or bulk of a discrete GPU. All models include dual Thunderbolt 4 ports (40Gbps with DisplayPort and PD charging), one USB-A 3.2 port, HDMI 2.1, a 3.5mm headset jack and a wedge lock slot for security. Wireless is modern Wi-Fi 7 and Bluetooth 5.4 for fast links to networks and other peripherals like mice and headsets.

The 13.3in display comes in three flavours that all have the same maximum 60Hz refresh rate. The entry FHD+ non-touch option is rated at 300 nits and 45% NTSC colour, but our variant has the FHD+ 400 nits panel with 100% sRGB coverage that suits workflows where colour accuracy matters. The QHD+ configuration is on the Ultra 7 machines and is upped to 500 nits (also 100% sRGB) and adds a touchscreen.

All three configs have an IR webcam that provides facial recognition and a proximity sensor that can lock the PC when you move away and wake it quickly when you return. The 8MP camera gives sharp video and decent low-light performance, while the presence detection features are pretty fast and reliable for auto lock/unlock.

The base spec is well balanced, and the Ultra 5 is more than powerful enough for everyday business use with headroom for heavier tasks like number crunching and huge spreadsheets. The Ultra 5 is very punchy for single-core workloads and is not far behind the Ultra 7, and only slightly slower in multi-core tasks. The Arc 130V iGPU is excellent and is on par with 140V performance in slimmer laptops. Under sustained CPU load, the fans are noticeable, yet during normal use, the machine is near silent.

The trackpad is responsive and the backlit keyboard, while small, is well laid out and longer typing sessions are comfortable even for people with larger hands. The speakers are better than expected considering the size, and video calls are nice and clear.

Dell advertises an "ExpressCharge" mode, but this needs a 100W charger and isn't available with the included compact 60W USB-C power adapter. That said, top-ups are still quite quick, and we got 50% capacity back in 37 minutes. Battery life is excellent thanks to the very efficient CPU, and in our testing we managed over 24 hours of video playback at 50% brightness and Wi-Fi on. In light office tasks, it can last just over 12 hours, but that drops closer to 8 hours with heavier workloads. Still, that is an impressive result and it's quite capable of making it through a day without charging. ■

BENCHMARK RESULTS	Dell 13 Pro Premium	Acer Swift 14 AI
CPU	**Intel Ultra 5 238V**	**Intel Ultra 5 226V**
GPU	**Intel Arc 130V**	**Intel Arc 130V**
Battery Capacity	**60Wh**	**75Wh**
RRP	**$2,750**	**$1,899**
PCMark 10	**6,909**	**6,442**
Cinebench R24 - CPU (multi-threaded)	582	541
Cinebench R24 - CPU (single-threaded)	119	113
Geekbench 6 - Multi-core	10,275	9,961
Geekbench 6 - Single-core	2,744	1,884
Geekbench 6 - GPU	26,091	24,654
CrossMark	1,732	978
3DMark Time Spy	3,760	4,438
3DMark Night Raid	34,285	36,616
Battery life - 1080p video playback (h:min)	24:34	13:43
CrystalDiskMark Read (MB/s)	6,489	N/A
CrystalDiskMark Write (MB/s)	4,800	N/A

SPECS W11 Pro; 13.3in, 1920 x 1200 pixel resolution, 400 nits, 100% sRGB; Intel Core Ultra 5 238V; Intel Arc Graphics; 32GB LPDDR5X RAM; 512GB SSD; 60Wh battery; 29.6 x 20.9 x 1.7 to 1.8cm; 1.07kg

VERDICT

★★★★☆

Excellent productivity focused performance and battery life from a very compact business laptop.

LINDSAY HANDMER

PRICE $2,499 **WEB** tinyurl.com/APC551proart

Asus ProArt Display 6K PA32QCV

Asus' 6K professional display aims to deliver uncompromising performance to creative workers.

apc
EDITOR'S CHOICE
ASUS ProArt
ProArt

> "Videographers shooting in 6K can see all their footage at once and that those shooting in 4K can see all their footage, plus all of their video editing toolbars, at the same time."

When we saw the 32-inch 6K PA32QCV at Computex, the specs alone sounded mind-blowing. Now that we've been living with it for weeks, does it fulfil its potential?

The core benefits of having a 6K professional display are that videographers shooting in 6K can see all their footage at once and that those shooting in 4K can see all their footage, plus all of their video editing toolbars, at the same time. These productivity benefits alone will be enough for some videographers to justify buying the 6K PA32QCV.

It has a solid, classy, (easy to fit-together) metal stand that will blend into any stylish studio. It comes with high-end HDMI and Thunderbolt cables which you'll likely need to avoid the screen occasionally blacking-out (as we discovered with our older cables) – they transmit a great deal of information!

Once up and running, the IPS panel presented us with a very impressive 6,016 x 3,384 resolution (218PPI) Windows Desktop that has bright and vibrant colours plus no reflections and minimal glare, thanks to special coatings. It's also Mac compatible. Just for office tasks, it offers an attractive multi-windowed working space where you can clearly see four windows at once without moving your neck around. An ambient light sensor, TÜV flicker free and Ultra-low blue light technologies all help make it very comfortable to stare at all day. A backlight sensor ensures that colours are accurate across the screen from the moment you turn it on.

It supports HDR10 and this makes multimedia look superb: details are visible in the darkest areas while the brightest areas, elsewhere on the screen, can melt your eyeballs. Some details can get lost in highlights, but this is easily addressed via the multitude of settings available. Both colourful and monochromatic transitions are stunningly smooth. The only thing you'll struggle with is fast-and-frantic gaming due to laws-of-physics issues surrounding the combination of fast refresh rates with extremely high resolutions: very-fast-moving objects can get blurry. Still, slower-paced games look phenomenal.

Image and video editing is indeed a joy thanks to all the screen real-estate and it's generally brilliant to interact with. It's just a shame that the tinny, quiet, twin 2-Watt speakers let the side down.

For those who want the techie details, know that it's a factory-calibrated and Calman Verified display that supports 98 per cent of the DCI-P3 colour space with a ΔE<2. The OSD menu is extensive but you're best-off using the impressive Asus DisplayWidget app which effortlessly facilitates multiple adjustments to a plethora of pre-set modes including BT.2020, DICOM, Rec.709, multiple P3 options and user-defined modes. You can even install voice recognition integration to adjust some features. But, this felt slow and gimmicky (and a bit privacy-violating) when we tried it.

The copious connectivity supports multiple picture-in-picture arrangements and daisy-chained displays and there's a USB-A and USB-C KVM hub too.

Surprisingly for new, top-tier technology, it's not massively expensive at $2,499. However, as a professional tool, its potential productivity boosts will mean the price is irrelevant for the target market, anyway. ■

VERDICT

★★★★★

It's phenomenal for anyone who does professional work.

NICK ROSS

SPECS 32-inch, matte, 6,016 x 3,384, HDR10, 60Hz, IPS; 5ms GTG response time; 600cd brightness; 3,000:1 contrast; 2x Thunderbolt 4 (Daisy Chain), 2x DisplayPort 1.4 DSC, 1x HDMI 2.1, 1x USB-C (96-Watt PD), 1x USB-C 3.2 Gen 2 (Hub), 2x USB-A 3.2 Gen 2 (Hub), headphone jack; Tilt +23° -5°, Swivel +30° -30°, Pivot +90° -90°, Height +-130mm; 714 x 618 x 240mm, 9.3KG.

PRICE $544 **WEB** www.draytek.com.au

DrayTek Vigor2136ax

Draytek's latest router has faster ports and an overhauled OS with many business-management upgrades.

apc
HIGHLY RECOMMENDED
DrayTek

"No surprise, the beefy hardware offers standout performance for productivity tasks, but what about gaming?"

If you're not familiar with Draytek, it's an old-school router maker that makes old-school routers that use old-school user interfaces along with bleeding edge security, privacy and VPN technologies for modern businesses. I could review the latest model, the SMB-focused Vigor2136ax, by simply listing all the relevant code numbers and acronyms that define it. So, let's see if we can humanise what's on offer...

The basic-looking router thumbs its nose at rivals which take their design cues from furniture, robot crabs and space ships. It has a 2.5GbE WAN port a 2.5GbE configurable WAN/LAN port and three Gigabit LAN ports. There are also two USB ports that can be used for connecting an FTP server, print server, thermometer or 4G failover adapters.

It supports Wi-Fi 6 at dual-band AX3000 speeds. Being Draytek, there's also a version without Wi-Fi for those who view it as a security risk. Either unit can function with up-to seven of DrayTek's new, modern-looking (cylindrical) VigorAP 805 access points which run the same firmware.

DrayTek makes the point that, compared with the previous Vigor2135, the 2.5Gbps ports push throughput up from 950Mbps to 2.3Gbps (and make IPSec throughput 2.3x faster).

For new users, the DrayOS 5 firmware is the star of the show. Accessed via web browser, it provides responsive access to countless settings related to all things networking.

Notable features (for the target market) include it arriving fully optimised to easily connect to multiple, ANZ broadband WAN technologies from providers including NBN and Starlink. It also lets you easily set-up and configure multiple LAN and Wi-Fi networks.

Both the 2.4GHz and 5GHz Wi-Fi channels can be set to connect to Wi-Fi hotspots for failover provision which, in conjunction with two 4G dongles and the W/LAN port, can guarantee uptime by bringing the number of potential, simultaneous, failover connections to five(!)

Other features that go above and beyond the norm include DrayDDNS which is a service which provides easy and secure remote access to the router from anywhere in the world; multiple QoS configurations that revolve around manual settings and applications; a business-grade firewall; plus, extensive web-content filters with an option for utilising pre-configured subscriptions.

It's statement features revolve around the VPN capabilities. The new hardware has four built-in VPN tunnels (up from two in the previous model) but the main attraction surrounds the identity and access management features. There are numerous options to manage both individual users and user groups (which might mean teams of telemarketers). Multi-factor security features are available (as are one-time passwords) and Draytek's free Smart VPN Client can be used on Windows, Mac, Android and iPhone. Numerous monitoring, logging and reporting features are also present.

At the end of the day, the DrayTek Vigor2136ax is the router you use to remotely manage an office that caters to remote workers. It prioritises security and reliability much more than any other networking product we've reviewed here and it offers significantly more supporting hardware and services too. You'll know if you need it. If you don't, it's not for you. ■

SPECS Speed: Dual-band Wi-Fi 6 AX3000Mbps; Connectivity: 1 x 2.5Gbps Ethernet WAN, 1 x 2.5Gbps Ethernet W/LAN, 3 x Gigabit Ethernet LAN, 2x USB 2.0 ports. Features: Four built-in VPN tunnels, bandwidth management, content filtering, failover management, remote user management.

VERDICT

★★★★☆

If you need a Wi-Fi router to manage an office with reliable and secure connectivity, this is it.

NICK ROSS

PRICE $579 **WEB** rog.asus.com

Asus ROG Falcata

A fast, responsive, feature-rich keyboard that looks ergonomic but prioritises gaming.

apc
HIGHLY RECOMMENDED

When is an ergonomic keyboard not an ergonomic keyboard? The ROG Falcata looks like an ergonomic keyboard, and it even has many of the usual features of boutique ergonomic keyboards, but essentially, it's a full-on gaming keyboard that just so happens to be fully split, with optional tenting and tilting. So why go to all that bother if it's not about ergonomics? Well, Asus says, "the unique split design allows users to detach the side of the right keyboard, retaining the left half when gaming… free[ing] up even more space for mouse movement."

At its core, the ROG Falcata is a compact 75% mechanical keyboard featuring ROG's HFX V2 magnetic (Hall effect) switches, 8kHz polling, per-key RGB lighting, and a multifunction media wheel. It measures 327mm by 127mm and weighs just under a kilo without the wrist rests—add those and the risers, and it gains another 750g, making it a surprisingly hefty and robust little unit.

While the ROG Falcata isn't a true ergonomic keyboard, it does offer better-than-average comfort for a gaming board. The split chassis is great for getting your shoulders into a comfortable position, and you can attach large silicone wrist pads that screw to each half of the keyboard.

You can adjust its angle using interchangeable feet for either tilt or tenting, which further helps improve posture. The included silicone wrist pads are dense and feel premium, but they're a bit low given the keyboard's high-profile keys. After extended use, I did notice some wrist strain due to the height. This is probably one reason why Asus chose not to market the ROG Falcata a board with ergonomic benefits.

The HFX V2 switches are honestly a dream – super fast and incredibly responsive. In fact, until using the Falcata, I hadn't realised just how much I rest my fingers on keys during gaming. The default sensitivity of the HFX V2 switches is so fine that they trigger on the slightest of pressures. That's easy to adjust, but you could easily use them in default mode and instead control your own gaming style.

The multifunction media wheel on the left side of the board is brilliant. A button just above it cycles through volume controls, the sensitivity of the rapid trigger, keyboard actuation points, media playback, lighting, and even custom commands. Below the wheel, there's a large dynamic LED strip that lets you know what level you've set everything to at a glance.

You can also tweak the board setting with Asus' beta online interface Gear Link. It's intuitive, lightweight, and (in theory) regularly updated, doing away with the need for local installs. It's a welcome move for ease of use and ongoing feature support.

The most limiting factor with the ROG Falcata? Connectivity. The two halves of the keyboard don't communicate wirelessly. They require a proprietary interconnect cable looks like standard USB-C, but has non-standard wiring. Asus includes two cable lengths, but both are quite short, which severely restricts layout flexibility – an odd oversight for a split keyboard.

The ROG Falcata is fantastic for pure gaming. It's easily the fastest and most responsive keyboard I've used. It's just a bit too uncomfortable for long sessions, thanks to the low wrist pads and high keys. ■

SPECS Size: 75% fully-split; Switches: ROG HFX V2 Magnetic Switch; Backlighting: Per key RGB; Anti-ghosting: N-key rollover; Polling rate: up to 8,000Hz (USB/2.4G); Dimensions: 327 x 127 x 38 mm (without wrist rests); Weight: 968 g (without cable and wrist rests); Connections: 2.4GHz, USB Type-C, Bluetooth 5.

VERDICT

★★★★☆

Asus' split keyboard delivers lightning-fast performance and premium features, but comfort quirks and a tethered design keep it from true ergonomic greatness.

NICK EVANSON & TROY COLEMAN

PRICE $349 **WEB** www.corsair.com

Corsair Vanguard Pro 96

For you are a magnet, and I am steel.

apc
EDITOR'S CHOICE

For newcomers to keyboards with magnetic, Hall effect switches, the Corsair Vanguard Pro 96 is a showcase of what next-gen input can feel like. Drawing inspiration from Dutch startup Wooting and its revolutionary Wooting 60HE keyboard, the Vanguard Pro 96 delivers magnetic precision with every keystroke, paired with the quality and reliability you'd expect from a top brand like Corsair.

Thanks to Corsair's hot-swappable MGX Hyperdrive magnetic switches, the Vanguard Pro 96 delivers an ultra-smooth, linear-like typing experience. Unlike traditional mechanical switches that use metal contacts, Hall effect switches rely on magnetic sensing for actuation. Because of this, gamers can take advantage of Rapid Trigger functionality for repeated key presses without fixed reset points and with minimal latency.

You can also set your own incredibly-precise actuation points (from 0.1mm to 4mm) on a per-key basis, allowing you to go ultra-shallow for lightning-fast inputs in a competitive shooter like *CS:GO*, or apply deeper actuation for deliberate, mistake-free typing. If you want to dive deeper, multi-actuation can also be set in the Corsair Web Hub, allowing you to assign different actions based on how far you press a single key. This means you could potentially switch from a jog to a full sprint depending on the depth of your keystroke. Of course, if the benefits of magnetic switches aren't a priority for you, you could save money by opting for Corsair's standard Vanguard 96 keyboard, which is offered with a selection of linear and tactile mechanical switch options.

Design-wise, the Vanguard Pro 96 isn't too much larger than a standard tenkeyless (TKL) keyboard, despite sporting a 96% layout with full numpad. On the left side of the board, there's a set of five programmable G keys alongside a dedicated 'Game Mode' button, which instantly adjusts the Vanguard Pro 96's RGB lighting to a simplified colour scheme and disables the Windows key. These keys are now low-profile and angled, making them more discreet and less prone to accidental presses compared to earlier models. Streamers and content creators will soon have the ability to assign shortcuts to these G keys for use with Elgato's Virtual Stream Deck, although this feature is currently in beta at the time of writing.

> "You can also set your own incredibly-precise actuation points (from 0.1mm to 4mm) on a per-key basis, allowing you to go ultra-shallow for lightning-fast inputs in a competitive shooter like *CS:GO*, or apply deeper actuation for deliberate, mistake-free typing."

To prove how serious Corsair is about this functionality, the Vanguard Pro 96 sports a dedicated key for launching the on-screen Stream Deck, conveniently positioned to the right of the FN key. Additionally, the keyboard's volume knob is set to gain new functionality with a future update, enabling users to adjust settings like white balance, brightness, lighting and more on the fly – much like the knobs on a Stream Deck+ unit. Next to the knob is a 1.9-inch LCD screen that lets you quickly check keyboard stats and access settings, like actuation points, without needing to open the Web Hub. Alternatively, you can use the screen to showcase your favourite GIF or even a picture of your cat – the choice is yours.

In the parlance of today's YouTube-obsessed kids, the Vanguard Pro 96's sound profile strikes an excellent balance between 'thocky' and 'creamy', where each silky keystroke's soft edge is rounded out by an exceedingly pleasant and buttery tone. The keyboard also features four layers of sound-dampening foam, further enhancing its acoustics for an incredibly satisfying typing experience. ■

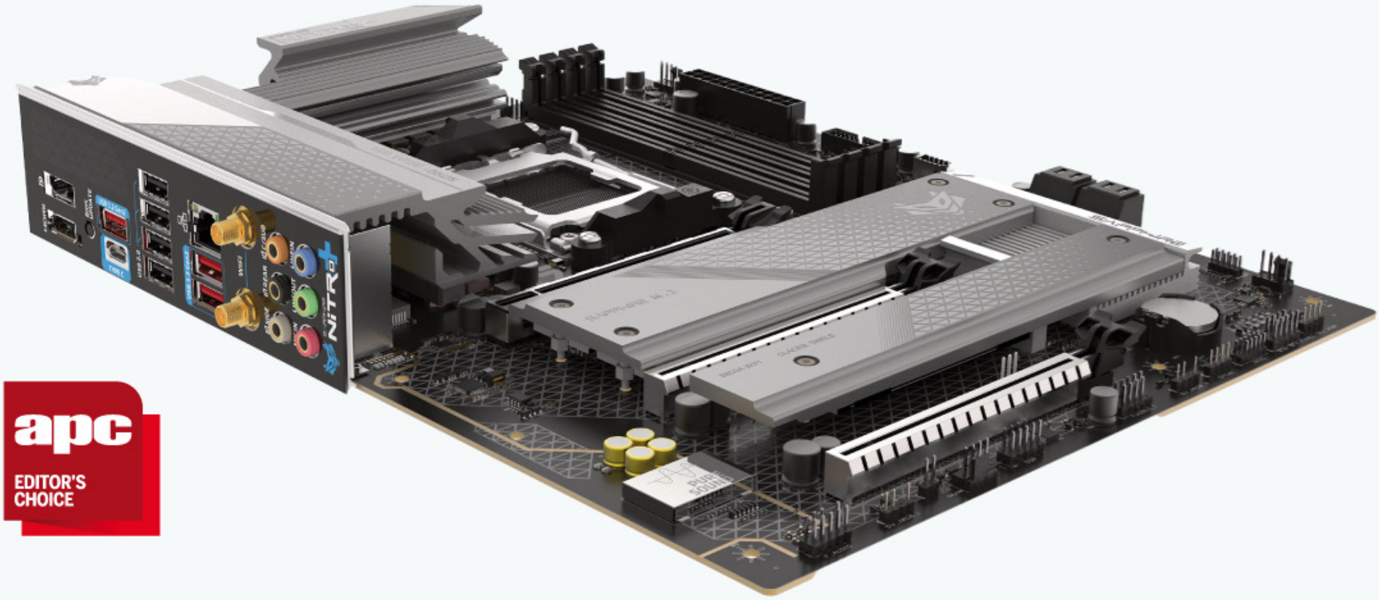
SPECS Length: 388 mm, width: 141 mm, height: 43 mm, weight: 1095g, wired USB (3.0 or above recommended), actuation force: 30-35g, actuation point: 0.1-4.0 mm, total keypress travel distance: 4.0 mm.

VERDICT

★★★★★

Corsair's Vanguard Pro 96 keyboard offers an outstanding typing experience and comes packed with features that would make even the most exacting gamer happy.

STEPHEN LAMBRECHTS



apc
EDITOR'S CHOICE

PRICE $TBA **WEB** sapphiretech.com

Sapphire Nitro+ B850A WiFi 7

A modern ATX AM5 board built for fast memory and the latest Ryzen CPUs.

It's been over a decade, but Sapphire is back with a new motherboard – the Nitro+ B850A WiFi 7. It's an AM5 board pitched at builders who want dependable power delivery, fast storage options and a clean, simple setup. It's ideal for Ryzen 9000 processors, as well as 8000 and 7000 series chips and uses an ATX layout with four DIMM slots for dual channel DDR5. For those wanting something smaller, Sapphire has also released the micro-ATX Nitro+ B850M WiFi with similar specs. In a nutshell, if you need a home for a Ryzen CPU, loads of memory and quick NVMe drives, or you like to tune BIOS settings for a little extra performance, this board is for you.

The memory setup uses the conventional four slots, which suits bigger kits and avoids the trade-offs that come with two-slot designs. Official support stretches to high 8000MHz (OC) DDR5 speeds when overclocked, with a capacity up to 256GB across four modules. While capable of pushing RAM performance, the board can also be configured to cater for latency sensitive gaming or creator workloads where stable memory is the most important metric.

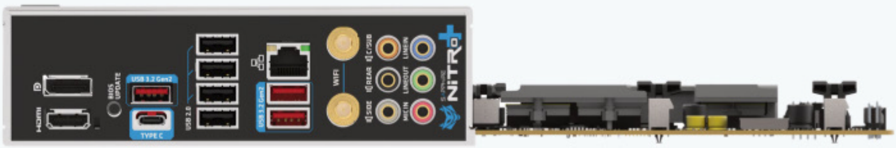
Storage options are decent, and you can run three 2280/2242 M.2 drives in total (with built-in heatsinks), with one configured for fast PCIe 5.0 x4 and the other two using PCIe 4.0 lanes from the chipset. That lets your system drive use the fast Gen 5 connection, while project files and game libraries live in additional NVMe drives. For even more storage, there are four SATA ports for 2.5-inch SSDs or bulk storage with 3.5-inch HDDs.

The B850A has a full speed PCIe 5.0 x16 slot for your graphics card, plus a PCIe 4.0 x4 and a PCIe 4.0 x2 slot for other options like capture, storage or network cards. The slot spacing is reasonable, but some large air coolers might be tight and the main M.2 connection does sit under the GPU, which limits third party SSD heatsink height.

Power delivery uses a 12 plus 2 plus 1 phase setup rated at 55 amps per phase, with large heatsinks, giving the board plenty of capacity to handle sustained multi-core loads without issue and still leaving headroom for manual tuning.

Rear I/O covers three 10 Gbps USB-A ports and one 10 Gbps USB-C, plus four USB 2.0, DisplayPort, HDMI and a Flash BIOS button. Front panel headers add a 5 Gbps USB-C and two 5 Gbps USB-A ports. While USB4 isn't expected at this price point, 20 Gbps USB would have been nice. Networking is via Wi-Fi 7 for wireless and 2.5 Gb Ethernet for wired, while audio is handled by a Realtek codec with 7.1 channel output (no S/PDIF).

While we don't have a local street price yet, with an expected price in mid $300s based on the $189 USD RRP, the Nitro+ B850A WiFi 7 is an excellent mid-range choice that focuses on the features most builders need rather than shiny extras that are rarely used. ■



SPECS ATX, Socket AM5; 1x PCIe 5.0 M.2 plus 2x PCIe 4.0 M.2; 4x SATA; 4x USB 10 Gbps, 2x USB 5 Gbps, header 1x USB 5 Gbps Type-C, HDMI 1.4, DisplayPort 1.2; 1x PCIe 5.0 x16, 1x PCIe 4.0 x4, 1x PCIe 4.0 x2; Wi-Fi 7, 2.5 GbE; Realtek ALC897 7.1 audio.

VERDICT

★★★★½

A practical four slot memory layout and capable VRM make the Nitro+ B850A WiFi 7 ideal for fast DDR5 and AM5 chips without stretching the budget.

LINDSAY HANDMER

apc
HIGHLY RECOMMENDED

PRICE $165 **WEB** silicon-power.com

Silicon Power XPower Storm RGB DDR5

A stylish RGB kit that balances speed, compatibility and value.

DDR5 prices keep trending down in Australia, making a 32GB 6000 MT/s kit a great choice for AM5 builds and upgrades. For Ryzen 7000, 6000 MT/s with modest timings is still the practical sweet spot, whereas for Ryzen 9000, 6400 MT/s is slightly better if your board can handle it. Intel users can get some benefit from higher frequencies if you are running bandwidth-heavy workloads.

Silicon Power's Xpower Storm RGB is a 32GB (2x16GB) kit with a simple white heat spreader (also available in black) and a lightbar that syncs with most motherboard software. The exact kit in the lab is SP032GXLWU60FFDL, rated DDR5-6000 at CL36-46-46-86, 1.35V and PC5-48000. It supports Intel XMP 3.0 and AMD EXPO and includes a limited lifetime warranty. Installation was painless and on our test setup the Storm RAM remained stable through extended testing of a Sapphire Nitro+ B850A Wi-Fi 7 motherboard. Overall the Xpower kit proved trouble free with no stability or compatibility issues to report, and it happily met its ratings, plus could be pushed further without issue.

Beyond performance, the hardware looks and feels premium. The aluminium spreader stays cool and the shark-gill lightbar gives a nicely diffused RGB effect. The module dimensions are normal for mid-height RAM at 133.4 x 43.5 x 8.8mm, so clearance won't be an issue.

Availability locally is good and street pricing is competitive against bigger brands. If you want stable plug-and-play DDR5 with tidy aesthetics and broad platform support, the Storm RGB is a great choice.

VERDICT

★★★★☆

A sleek RGB DDR5 kit that gives solid performance for the price.

LINDSAY HANDMER

SPECS 2x 16GB; CL36-46-46-86; PC5-48000; 1.35V; Profiles: Intel XMP 3.0, AMD EXPO; Limited Lifetime Warranty; 43.5(H) x 133.4(L) x 8.8(W)mm.

> "The 1TB US75 (as tested) is rated for 7,000 MB/s sequential reads and 6,000 MB/s sequential writes – making it a good fit for handling large media files, giving fast game access or other storage heavy tasks."

apc
EDITOR'S CHOICE

PRICE $109 (1TB) **WEB** silicon-power.com

Silicon Power US75 SSD

Fast yet affordable PCIe Gen4 storage for creators and gamers.

We have the Silicon Power US75 in the labs this month – a Gen4 NVMe SSD that offers high-end performance for mainstream builds without trying to get too fancy. It slots into the middle of the Silicon Power range and is one of the cheaper 7GB/s-class Gen4 drives in Australia.

The 1TB US75 (as tested) is rated for 7,000 MB/s sequential reads and 6,000 MB/s sequential writes – making it a good fit for handling large media files, giving fast game access or other storage heavy tasks. The US75 is a single sided module and uses the Maxio MAP1602 controller for decent efficiency. While currently hard to find in every capacity, Silicon Power offers it in 500GB, 1TB, 2TB or 4TB versions with endurance of 300TBW for 500GB, 600TBW for 1TB, 1.2PBW for 2TB and 2.4PBW for the 4TB drive – all backed by a 5-year warranty.

In CrystalDiskMark the US75 hit 7,356 MB/s sequential reads and 6,233 MB/s writes, and the real world profile which mimics everyday file work more closely gave 4,412 MB/s reads and 5,806 MB/s writes. Using the Blackmagic speed test, we got 5,847 MB/s reads, and 5,626 MB/s writes. In Iometer the drive gave 690k read IOPS and 982k write IOPS – a great result that keeps up with pricier Gen4 drives. Even in sustained runs the US75 stayed reasonably cool despite the lack of heatsink, but adding one is still a good idea for hot gaming builds.

VERDICT

★★★★⯪

Excellent Gen4 speeds at a price that few other drives can match.

LINDSAY HANDMER

SPECS M.2 2280 NVMe, PCIe 4.0 x4; 500GB (300TBW), 1TB (600TBW), 2TB (1.2PBW), 4TB (2.4PBW) capacity; 80mm x 22mm x 3.6mm, 8g; 5-year warranty.

AI ASSISTANT

NEEDS Windows 10 or 11 **WEB** www.wisecleaner.com/wisex.html

WiseX 1.01

A new AI assistant you can use on your desktop.

From the company behind the free software Wise Disk Cleaner and Wise Program Uninstaller (see our Best Free Apps feature in APC 549), WiseX is a new AI assistant you can use on your desktop. Rather than limit you to its own set of large language models (LLMs), it lets you switch between multiple AI tools without having to open their apps or websites.

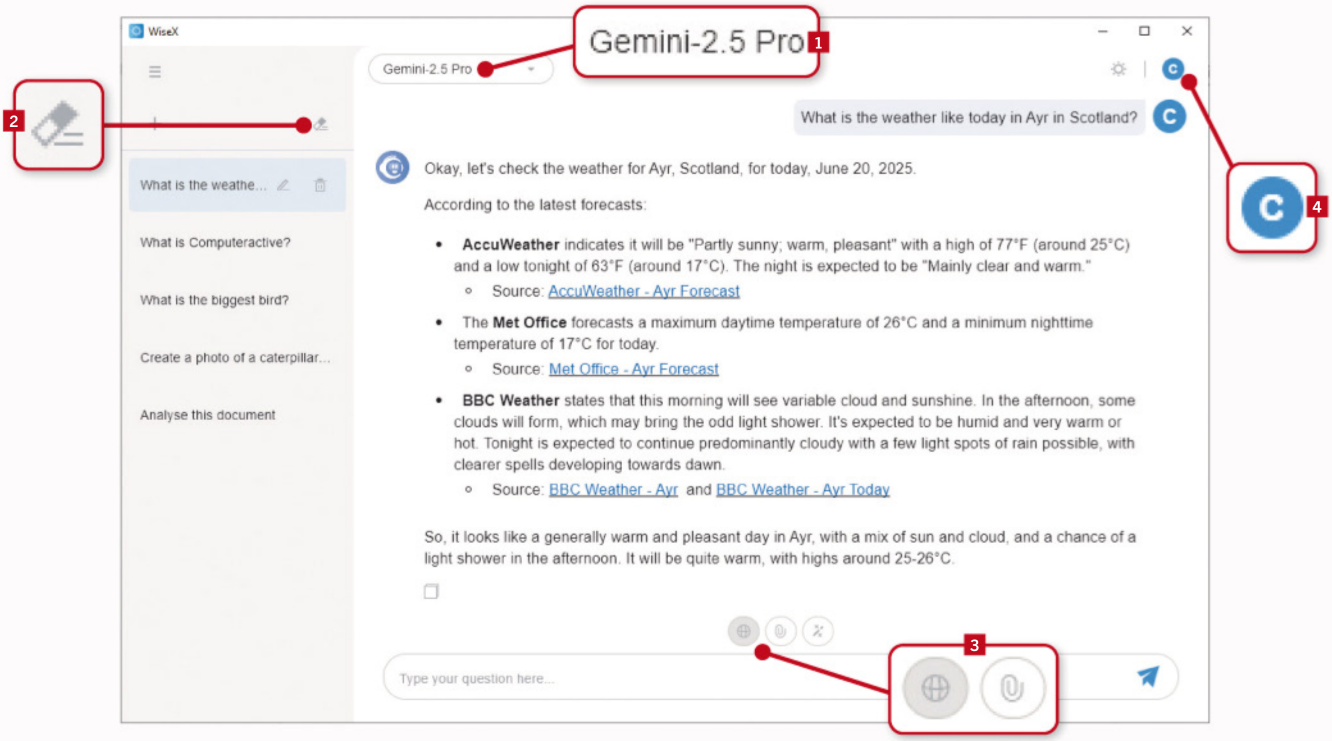
Options include OpenAI's GPT 4-o, Google's Gemini 2.5 Pro and the Chinese-owned DeepSeek. The latter may raise eyebrows, but by accessing the LLM through WiseX (without a DeepSeek account), you'll avoid the privacy concerns surrounding the DeepSeek app and website. Several AI tools, including Hugging Face and Brave Leo, also provide independent access to DeepSeek.

To use WiseX, simply type a query or command into the message box and click Send. Depending on the model you've selected, it can search the web to provide up-to-date answers and analyse files you upload.

Its AI models include useful tools for working with images, such as generating pictures from text prompts, erasing unwanted objects and people, and removing backgrounds. These generally work well, though images you upload must be under 10MB in size and 2048x2048 pixels in resolution.

WiseX is free to use, after you create an account and enter a verification code. However, certain AI models place limits on how many requests they'll process for free. After that, they require tokens for which you need to purchase credits. WiseX gives you five complimentary credits, which doesn't sound like much, but as most tokens use only 0.1 credits it's enough to decide whether you like the program. Further credits cost from $1 for 10 via PayPal.

It's early days for WiseX, and we experienced a few errors and noticed some spelling mistakes in its options ('Photo Restioration', for example). But it's fun to play around with and, if you don't get the answer you need from one AI model, just switch to another.



What is the weather like today in Ayr in Scotland?

Okay, let's check the weather for Ayr, Scotland, for today, June 20, 2025.

According to the latest forecasts:

- **AccuWeather** indicates it will be "Partly sunny; warm, pleasant" with a high of 77°F (around 25°C) and a low tonight of 63°F (around 17°C). The night is expected to be "Mainly clear and warm."
  - Source: AccuWeather - Ayr Forecast
- The **Met Office** forecasts a maximum daytime temperature of 26°C and a minimum nighttime temperature of 17°C for today.
  - Source: Met Office - Ayr Forecast
- **BBC Weather** states that this morning will see variable cloud and sunshine. In the afternoon, some clouds will form, which may bring the odd light shower. It's expected to be humid and very warm or hot. Tonight is expected to continue predominantly cloudy with a few light spots of rain possible, with clearer spells developing towards dawn.
  - Source: BBC Weather - Ayr and BBC Weather - Ayr Today

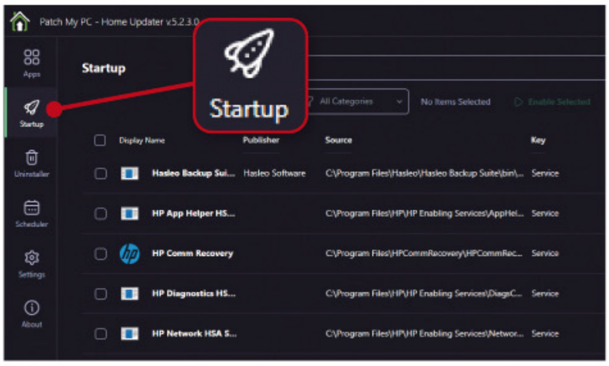
So, it looks like a generally warm and pleasant day in Ayr, with a mix of sun and cloud, and a chance of a light shower in the afternoon. It will be quite warm, with highs around 25-26°C.

1 Click the dropdown menu at the top to choose from over 20 AI models. These include GPT-4o, Gemini 2.5 Pro and DeepSeek (plus some other Chinese LLMs), and tools for generating, enhancing and removing unwanted elements from images.

2 Delete a chat from WiseX by hovering your cursor over it and clicking the bin icon, or wipe all your conversations by clicking Clear History. It's always good practise to delete your data from AI tools to protect your privacy.

3 Click the globe icon above the message box to activate web search for the current AI model, so you can get up-to-date information. Click the paperclip icon to upload a file from your hard drive and ask the AI tool about its content.

4 To check how many free credits you have left from the five that WiseX gives you, click your profile icon in the top-right corner. When you hit your quota, click the Buy Credits link to get more - prices start from $1 for 10 credits.


Patch My PC - Home Updater v.5.2.3.0
Apps
Startup
Uninstaller
Scheduler
Settings
About
Startup
All Categories
No Items Selected
Enable Selected
Startup

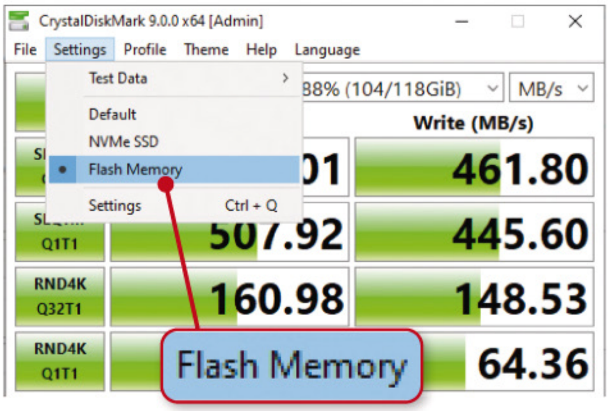
Display Name	Publisher	Source	Key
Hasleo Backup Sui...	Hasleo Software	C:\Program Files\Hasleo\Hasleo Backup Suite\bin\...	Service
HP App Helper HS...		C:\Program Files\HP\HP Enabling Services\AppHel...	Service
HP Comm Recovery		C:\Program Files\HPCommRecovery\HPCommRec...	Service
HP Diagnostics HS...		C:\Program Files\HP\HP Enabling Services\DiagsC...	Service
HP Network HSA S...		C:\Program Files\HP\HP Enabling Services\Networ...	Service

SOFTWARE UPDATER

NEEDS Windows 10 or 11 **WEB** tinyurl.com/APC551patch

PATCH MY PC HOME UPDATER 5.2.3

Patch My PC has been updated again to make it even better at managing software. The big new feature is a startup manager, which you access by clicking Startup in the left-hand toolbar (see screenshot). This lists all the tools that launch automatically when you start Windows and lets you disable them with a single click. Doing so will help your PC boot faster and stop unnecessary background processes slowing it down. You can re-enable programs if you change your mind. Another new option lets you remove portable tools (that aren't actually installed) from the Apps and Uninstaller tabs by right-clicking them. Patch My PC has added support for further software, including Wise Video Converter and Microsoft's PC Health Check.


CrystalDiskMark 9.0.0 x64 [Admin]
File
Settings
Profile
Theme
Help
Language
Test Data
Default
NVMe SSD
Flash Memory
Settings Ctrl + Q
88% (104/118GiB)
MB/s
Write (MB/s)
461.80
507.92
445.60
RND4K Q32T1
160.98
148.53
RND4K Q1T1
64.36
Flash Memory

BENCHMARKING TOOL

NEEDS Windows 7, 8.1, 10 or 11

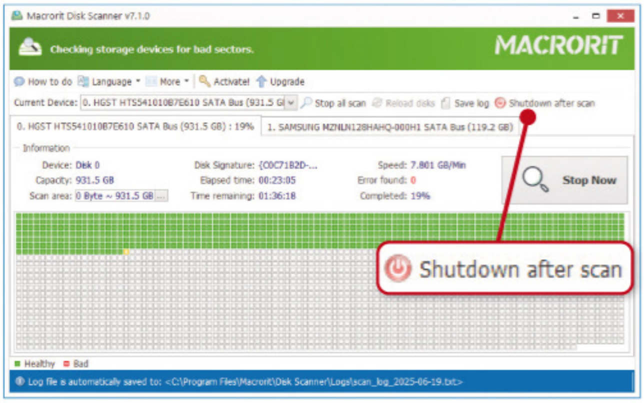
WEB crystalmark.info/en/download

CRYSTALDISKMARK

CrystalDiskMark tests the read and write speeds of hard drives, SSDs and external drives, so you can check if they're becoming slower over time. It performs four tests to verify how fast your drive can read and write both sequential and random data. The latest version reduces the default number of times these four tests are carried out, from five to three. This will save you time while still providing accurate results, but you can increase it to nine if you prefer. CrystalDiskMark has also added a setting for testing the flash memory in SSDs, USB sticks and SD cards. Click the Settings menu and choose Flash Memory (see screenshot) to adjust its tests accordingly. Although it's a great program, CrystalDiskMark has a confusing website, so we recommend downloading it from SourceForge (**tinyurl.com/APC551crystal**) instead.

Should I pay for?

Choose the right version of software


Macrorit Disk Scanner v7.1.0
Checking storage devices for bad sectors.
MACRORIT
How to do
Language
More
Activate!
Upgrade
Stop all scan
Reload disks
Save log
Shutdown after scan
Information
Stop Now
Healthy
Bad
Shutdown after scan

Current Device: 0. HGST HTS541010B7E610 SATA Bus (931.5 G

0. HGST HTS541010B7E610 SATA Bus (931.5 GB) : 19%
1. SAMSUNG MZNLN128HAHQ-000H1 SATA Bus (119.2 GB)

Device: Disk 0
Capacity: 931.5 GB
Scan area: 0 Byte ~ 931.5 GB
Disk Signature: {C0C71B2D-...
Elapsed time: 00:23:05
Time remaining: 01:36:18
Speed: 7.801 GB/Min
Error found: 0
Completed: 19%

Log file is automatically saved to: <C:\Program Files\Macrorit\Disk Scanner\Logs\scan_log_2025-06-19.txt>

DISK SCANNER

PRICE $30.39 **FREE TRIAL PERIOD** N/A

NEEDS Windows 7, 8.1, 10 or 11

WEB tinyurl.com/APC551macrorit

CRYSTALDISKMARK

Rather than test the speed of your drives like CrystalDiskMark (see left), Macrorit Disk Scanner checks for bad sectors. These are areas that can no longer store data, which can result in files becoming lost and unreadable, and affect the speed and reliability of your system.

Both the Free and Pro editions perform thorough scans of your hard drive or SSD, and provide a visual map. This marks bad sectors in red and healthy ones in green. The Pro version has the advantage of scanning multiple drives at the same time, to save you having to check them individually.

However, it's important to note that neither edition – or the pricier Macrorit Disk Scanner Unlimited, which osts $176.34 – actually fixes bad sectors. Instead, they merely tell you if a drive is putting your data at risk so you can replace it.

This makes Macrorit Disk Scanner a useful tool to add to your arsenal of PC-maintenance software, but also highlights that it's not worth paying for. Other than multiple-disk scanning, the only extra feature it offers is automatic shutdown once a scan is complete (see screenshot).

Because scans take a long time, this option means you can leave the program running while you get on with other things and let it turn off your PC for you. But as you're unlikely to use Macrorit Disk Scanner very often, it's hardly essential.

OUR VERDICT: DON'T PAY FOR IT

Macrorit Disk Scanner offers a reliable way to detect bad sectors on your hard drives. But the only features in the Pro version not available for free are scanning several drives at once and automatic shutdown. ■

> "Both the Free and Pro editions perform thorough scans of your hard drive or SSD, and provide a visual map. This marks bad sectors in red and healthy ones in green."

WRITING AND TRACKING APP

PRICE (IAPs $17.99/month, $149.99/year) **WEB** craft.do **NEEDS** macOS 12 or later

Craft

Create and manage lists, text and more.

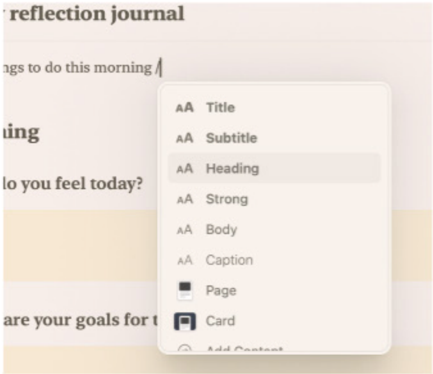
Craft is a multi-platform application that combines different kinds of functionality found in various writing, note-taking, calendar and to-do apps. It's free to try with a few limitations, then fairly inexpensive to subscribe to if you want all the bells and whistles. But does it provide more than the free apps you may already own?

Craft takes its own approach to content creation and a quick spin through the intro videos is helpful if you're new to the app. At the top level you have Documents, which are a canvas into which you can place all sorts of things. Every piece of content from text to images, lists and links is known as a "block" and is editable within a document.

This editability includes free and easy movement of blocks – so any content – on a page. Anyone who has cursed Microsoft Word for refusing to let you place a box in a location without snapping it incorrectly somewhere else will find this a breath of fresh air. Apple's Pages is better, but still restrictive. To compare it to writing apps alone is to do it an injustice however, since there's much more on offer.

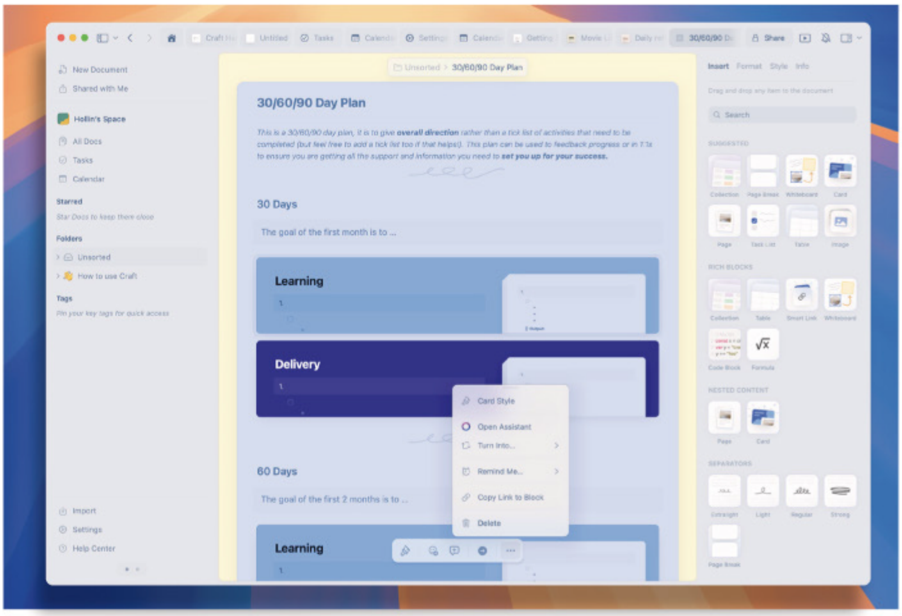
There are templates of course, and you can also add content by dragging, pasting or pressing the [/] key, which reveals a menu of shortcuts – a system which will be familiar to anyone who has ever written code. It's a great approach and quickly becomes second nature. Typing the first few letters reveals all available content types, so for example start to type "list" and you'll see all available list types. Similarly, "table" gives you a bunch of table types and sizes.

Formatting content is also nicely handled so you can simply drag to draw around items, press the [/] key and choose an action, say adding bold formatting to text or aligning images in a specific way. If a content type isn't compatible with the command it will simply be ignored. It's hard to overstate how natural this feels as a system for editing and formatting content, especially when you've spent years fighting the absurdities of other leading desktop publishing (DTP) software.



Craft enables you to add or format content very quickly with a simple, universal key shortcut command.

> "It's hard to overstate how natural this feels as a system for editing and formatting content, especially when you've spent years fighting the absurdities of other leading desktop publishing (DTP) software."

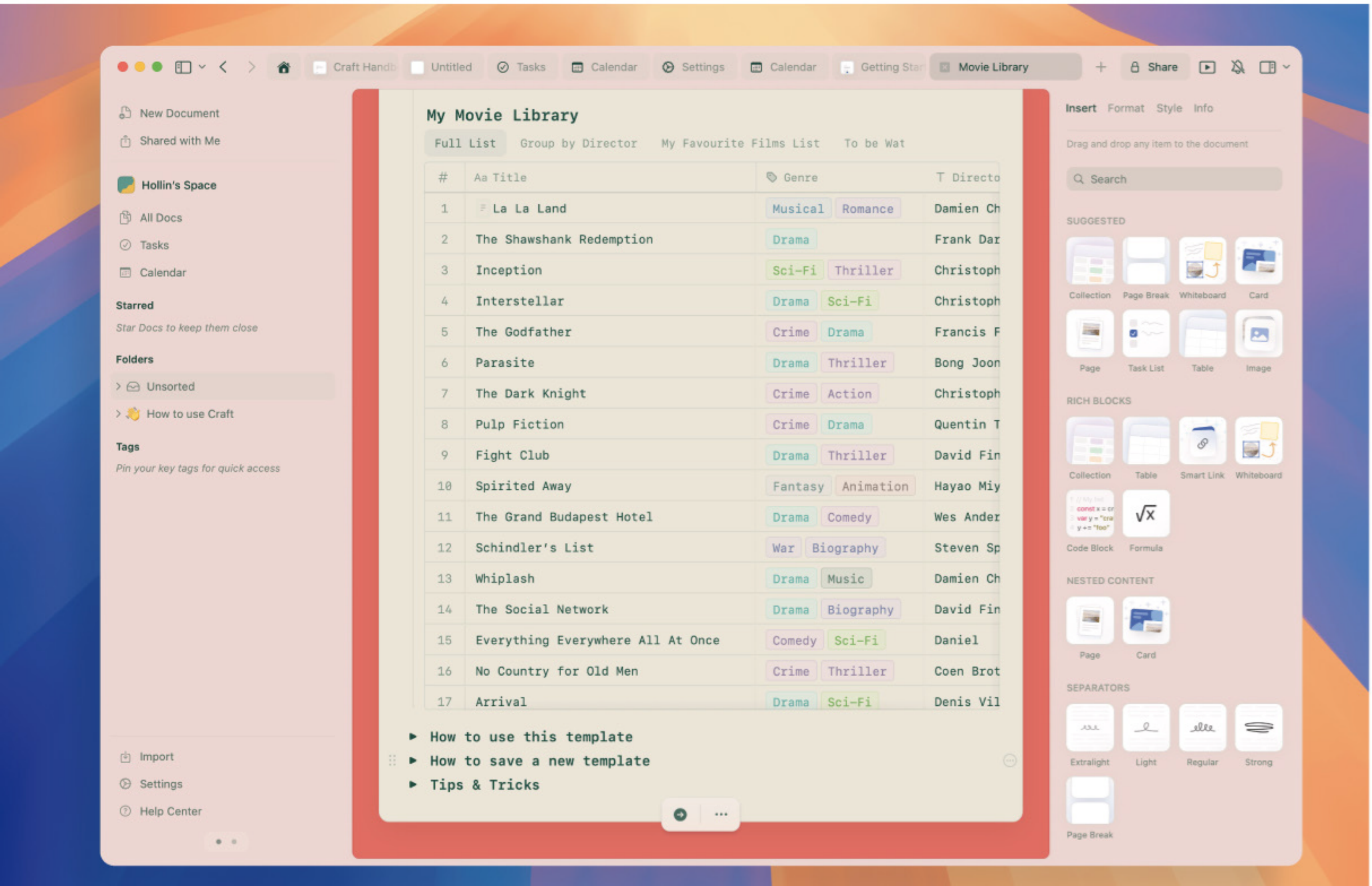


Craft has access to multiple artificial intelligence (AI) engines to suggest, correct or summarise content.

EASY EDITING

There's also built-in access to a variety of online artificial intelligence (AI) engines you can use to summarise, edit, spell check or rewrite your text directly from inside Craft. Documents can use graphical and colour styles and there's a formatting panel with all the usual stuff – colours, fonts, alignment and so on, but also Rich Blocks including things like Collections, which are mini databases you can insert into documents and populate with fields. Cards are another system Craft uses for managing and displaying content and are a little like sub-pages.

Craft incorporates a task manager section with an inbox, reminders and task tracking plus integration with Apple's Calendar and Reminders. The editability continues with the option to nest and link blocks, enabling you to take your content and quickly combine it into a sub-section, convert it to a different content type and more.


Craft Handb
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Settings
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Getting Star
Movie Library
Share
New Document
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Hollin's Space
All Docs
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Starred
Star Docs to keep them close
Folders
Unsorted
How to use Craft
Tags
Pin your key tags for quick access
Import
Settings
Help Center
Insert
Format
Style
Info
Drag and drop any item to the document
Search
SUGGESTED
Collection
Page Break
Whiteboard
Card
Page
Task List
Table
Image
RICH BLOCKS
Collection
Table
Smart Link
Whiteboard
Code Block
Formula
NESTED CONTENT
Page
Card
SEPARATORS
Extralight
Light
Regular
Strong
Page Break

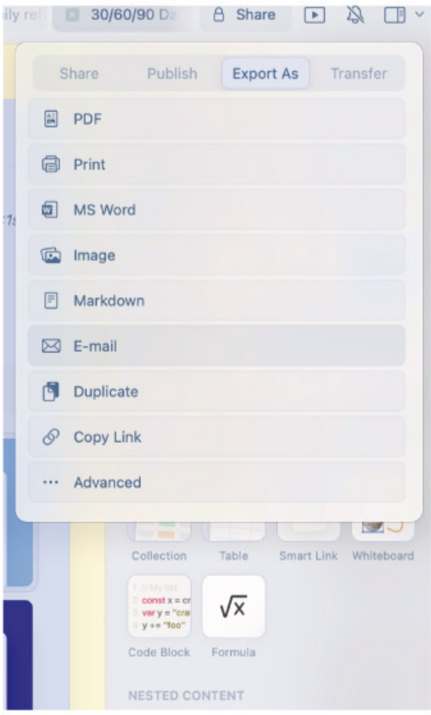
My Movie Library

Full List | Group by Director | My Favourite Films List | To be Wat

#	Aa Title	Genre	T Directo
1	La La Land	Musical Romance	Damien Ch
2	The Shawshank Redemption	Drama	Frank Dar
3	Inception	Sci-Fi Thriller	Christoph
4	Interstellar	Drama Sci-Fi	Christoph
5	The Godfather	Crime Drama	Francis F
6	Parasite	Drama Thriller	Bong Joon
7	The Dark Knight	Crime Action	Christoph
8	Pulp Fiction	Crime Drama	Quentin T
9	Fight Club	Drama Thriller	David Fin
10	Spirited Away	Fantasy Animation	Hayao Miy
11	The Grand Budapest Hotel	Drama Comedy	Wes Ander
12	Schindler's List	War Biography	Steven Sp
13	Whiplash	Drama Music	Damien Ch
14	The Social Network	Drama Biography	David Fin
15	Everything Everywhere All At Once	Comedy Sci-Fi	Daniel
16	No Country for Old Men	Crime Thriller	Coen Brot
17	Arrival	Drama Sci-Fi	Denis Vil

- How to use this template
- How to save a new template
- Tips & Tricks

Collections are mini databases – just one of the types of content you can create and edit.


30/60/90 D
Share
Share
Publish
Export As
Transfer
PDF
Print
MS Word
Image
Markdown
E-mail
Duplicate
Copy Link
Advanced
Collection
Table
Smart Link
Whiteboard
Code Block
Formula
NESTED CONTENT

Share your documents in multiple formats and to a large range of online formats and locations.

> **"There's also built-in access to a variety of AI engines you can use to edit, check or rewrite text"**

Anything you create will sync across Craft on your Mac, iPhone, iPad and a PC whenever you have an internet connection, so it's all able to be edited from anywhere and saved in the cloud. This seems to work using the company's cloud and not iCloud, so the free plan has 1GB of storage while the paid plan's storage is unlimited. The free plan also limits you to 1,500 blocks of content, which is fine for light use but not for creating bigger projects over time.

SHARE AND SHARE ALIKE

When your document is finished you can share it, including inviting online collaborators (even if they do not own a copy of Craft), exporting in all major formats including PDF, Word and Markdown, and publishing directly to the web with a password-protected web link. You can also transfer the documents and their content to apps such as Omnifocus, Things, IA Writer and others if they are installed.

Craft is a very powerful app, though this means there is a bit of a learning curve. While some things such as formatting are natural, the depth of features and the concepts in use mean not everything is obvious at first. It's also overkill if you're only going to use a couple of its features. If you plan on doing more however, it's a multi-talented and fairly inexpensive alternative to a number of mainstream apps, all rolled into one.

VERDICT

★★★☆☆

A powerful writing and tracking app with strong features, though potentially overkill for some.

HOLLIN JONES

Ditch Google for Proton

Google tools may be free and easy to use, but they also compromise your privacy. **Robert Irvine** explains why you should switch to Proton's safer and better alternatives.

Despite fierce competition from Amazon, Meta and TikTok, Google remains the most notorious tech company for invading its users' privacy. It tracks you around the web, across your devices and even in the real world, collecting your data so its 'partners' can target you with personalised ads.

In previous features, we've recommended ditching Google Search for more private search engines such as DuckDuckGo, and Chrome for a a less intrusive browser like Brave (or DuckDuckGo again). But what about other Google tools such as Gmail, Google Drive and Google Password Manager?

These store sensitive data including your emails, personal files and passwords, but Google infamously doesn't protect that data using end-to-end encryption. Although there are alternative tools that do, they can be tricky to master and you'll need to switch between multiple services.

Proton (**https://proton.me**) provides a solution to this privacy problem. It offers equivalents to many Google tools, which don't collect, share or analyse your data, and stores it securely so only you can access it.

Proton's services and software are as simple to use as Google's, and are integrated in a similarly convenient way. Here, we explain why you can trust Proton with your private data and show you how to use all its brilliant free tools on your PC, phone and tablet.

What you can do

- Transfer Gmail messages to a secure alternative
- Block tracking pixels and links in emails you receive
- Check the security of all your account passwords
- Protect your files and photos with end-to-end encryption
- Share documents securely using time-limited links
- Connect to free VPN servers with no data limit

YOUR PROTON QUESTIONS ANSWERED

What is Proton?

Proton is a Swiss technology company, based in Geneva, that specialises in privacy-focused software and services. It was founded in 2014 by a team of scientists who met at CERN (the European Organisation for Nuclear Research) and "decided to build a better internet where privacy is the default" (**https://proton.me/about**).

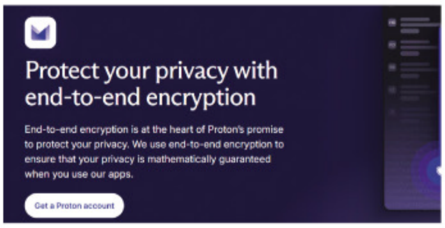
The company launched its first tool, Proton Mail, through a crowdfunding campaign with the goal of creating the world's most secure email service. Proton is now funded by grants and paid subscriptions, and last year set up a non-profit organisation called the Proton Foundation, which is now its controlling shareholder (**tinyurl.com/APC551foundation**).

How is Proton more private than Google?

As a Swiss company, Proton is protected by the country's privacy laws, which are among the strictest in the world. Switzerland's neutrality means it's not subject to intelligence-sharing agreements, such as those of the Five Eyes, Nine Eyes and Fourteen Eyes alliances (**tinyurl.com/APC551eyes**), and Swiss companies are prohibited from passing data to foreign law-enforcement agencies.

Proton further prevents surveillance by providing end-to-end encryption for all its tools (see screenshot below), so your privacy is "mathematically guaranteed". Unlike in Australia, the US, UK and EU, the Swiss government has not introduced or considered any legislation to limit users' right to encryption.

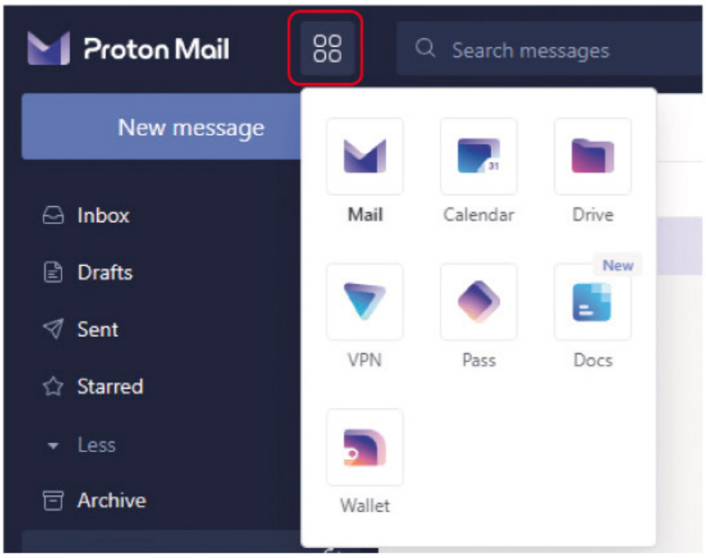
The company says it doesn't possess the keys required to decrypt users' data: "As a result, even if Proton were forced to turn over all our computer systems, your data would continue to be encrypted" (**https://proton.me/blog/switzerland**). What's more, unlike Google, all Proton tools are free of ads and don't collect or share your data for advertising or any other purpose.



Protect your privacy with end-to-end encryption

End-to-end encryption is at the heart of Proton's promise to protect your privacy. We use end-to-end encryption to ensure that your privacy is mathematically guaranteed when you use our apps.

All Proton tools guarantee your privacy using end-to-end encryption.



Switch between Proton tools by clicking the 'Proton applications' button in the top-left corner.

Where does Proton store users' data?

Proton initially stored its users' data in a former military bunker, built into a Swiss mountain under 1,000 metres of granite. When Proton Mail and the company's other tools became popular, it moved to a larger data centre in Zurich and additional centres in Germany and Norway.

These data centres outside Switzerland allow Proton to provide a faster and more reliable service. All user data is still protected by Swiss privacy laws, and Proton says its zero-access encryption ensures your data remains private no matter where its servers are located.

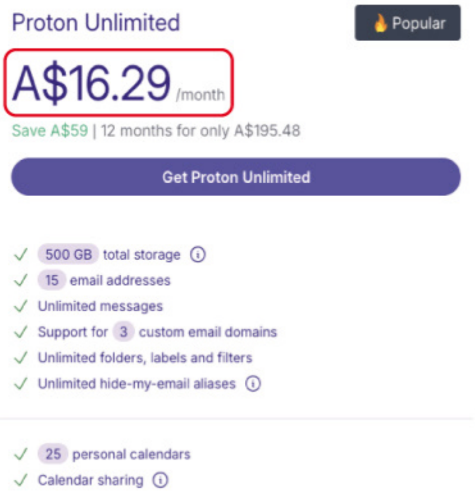
What tools does Proton offer?

As well as Proton Mail, the company offers an online storage service (which includes a document editor), password manager, VPN, calendar and digital wallet. We'll explain how to use all these tools in this feature, and reveal what makes them better than Google's equivalents (where applicable).

Once you've registered for a Proton account, you can switch easily between Proton's online services by clicking the 'Proton applications' button in the top-left corner (see screenshot above). All its tools now have Android and iOS apps, too, so you can use them on your phone and tablet as well as on your computer.

Are Proton's tools free to use?

Yes, all Proton tools are free to use, but they also have paid-for Plus plans. These include extra 'premium' features, a lot more storage and greater flexibility, such as letting you choose which VPN server to connect to. We focus on the free versions in this feature, but we'll also explain the benefits of upgrading.



Save A$59 | 12 months for only A$195.48

- ✓ 500 GB total storage
- ✓ 15 email addresses
- ✓ Unlimited messages
- ✓ Support for 3 custom email domains
- ✓ Unlimited folders, labels and filters
- ✓ Unlimited hide-my-email aliases

- ✓ 25 personal calendars
- ✓ Calendar sharing

Proton Unlimited offers all its premium features for $16.29 a month.

You can save money by subscribing to Proton Unlimited, which combines all the Plus plans and gives you 500GB of storage. It costs $21.19 per month, discounted to $16.29 if you pay for a year's subscription (see screenshot above). See **https://proton.me/pricing** for details.

How popular is Proton?

Proton says more than 100 million people and businesses have signed up for an account. Its popularity may pale in comparison to Google's billions of users but, unlike Google, Proton's end-to-end encryption ensures everyone who uses its tools can do so privately and securely.

DITCH GMAIL FOR PROTON MAIL

You need a Proton Mail account to use the company's other software and services, in the same way a Gmail account is necessary to access most of Google tools. The free version of Proton's secure email service gives you 500MB of storage and one private email address, with end-to-end encryption enabled by default. You can use Proton Mail on as many devices as you want.

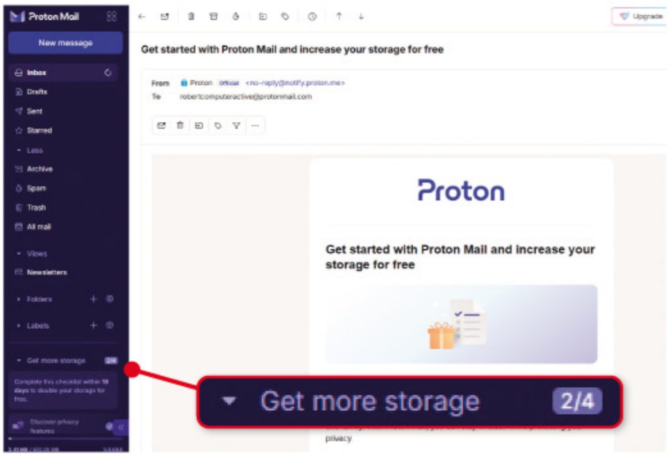
Visit **https://proton.me/mail**, click 'Create a free account' and select the Free plan. Enter a username and password, and choose between an '@proton.me' or '@protonmail.com' email address. Click 'Start using Proton Mail now' – choose 'No thanks' to decline the upgrade to the Plus version – and complete the Captcha.

Select a display name for your Proton Mail account, and optionally set up a recovery method in case you get locked out. You'll now be taken to your new Inbox. Here's what to do next.

Import your emails from other services

Proton Mail lets you import emails from Gmail, Outlook and Yahoo Mail, so you can store and read messages in a private, ad-free environment. However, because the free plan includes just 500MB of storage, you may not have enough space for all your emails – see the next tip to find out how to double your storage.

To import emails and contacts from Gmail, click the Settings cog in the top-right corner and choose 'All settings'. Select 'Import via Easy Switch' (**1** in our screenshot below) then 'Import from Google' **2**, and tick Emails and Contacts. Click 'Start Import' and give Proton Mail access to your Google account.


Proton Mail
New message
Inbox
Drafts
Sent
Starred
Archive
Spam
Trash
All mail
Get started with Proton Mail and increase your storage for free
Proton
Get more storage 2/4

Increase your storage to 1GB by completing Proton's checklist of actions.

Proton Mail will tell you which email data it's going to import. Click 'Customize' to exclude specific folders or include only messages from within a certain date range. It will import the most recent emails first, and stop when it hits the 500MB limit (you can delete unwanted messages to reclaim space). Click 'Start Import' again to import your data.

Alternatively, rather than filling up your Inbox with old messages, you can forward new messages from Gmail to Proton Mail. This will also remove trackers (see 'Block hidden trackers' tip) and encrypt their content. On the 'Import via Easy Switch' page, click 'Set up auto-forwarding from Gmail' **3** then 'Sign in with Google'. Select your Gmail account and grant Proton access to auto-forward emails.

Double your email storage

To make room for more messages, you can double your 500MB of Proton Mail storage to 1GB for free – but you need to act fast. Complete a checklist of actions within 15 days of opening your account (confusingly, Proton also says 18 days) and you'll unlock that extra 500MB.

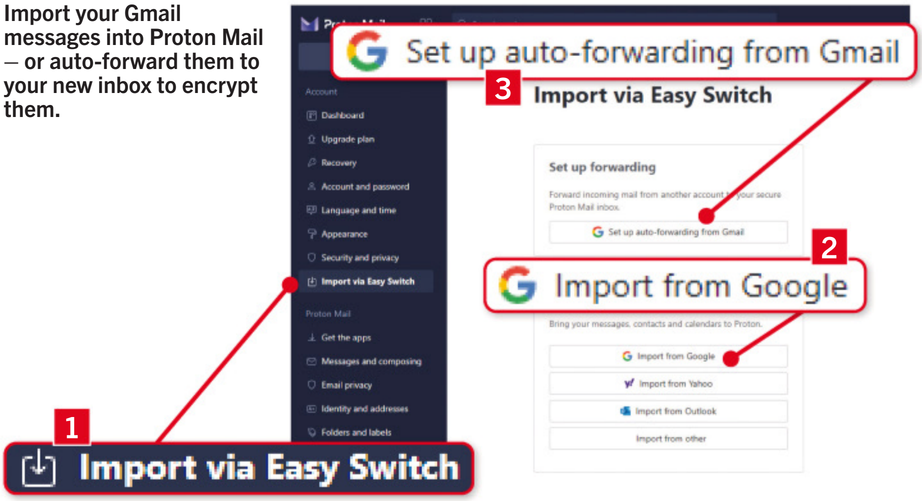
You'll find this checklist under 'Get more storage' in the bottom-left corner of your Inbox (see screenshot in previous tip). The actions include learning about Proton Mail's privacy features, auto-forwarding Gmail messages (see above), updating your website logins to use your new email address and installing Proton Mail's mobile app.

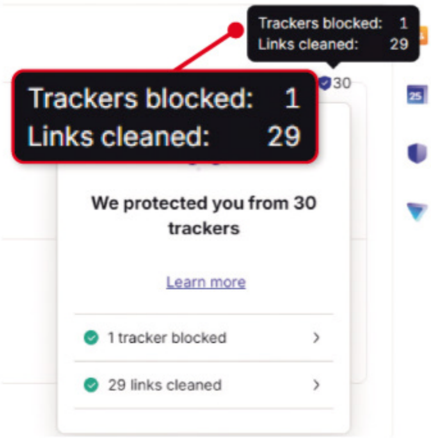
Once you've completed these tasks, Proton will increase your storage limit to 1GB. You can get 15GB by upgrading to Proton Mail Plus (see the box on the opposite page) or 500GB (across all Proton tools) by subscribing to Proton Unlimited (see previous page).

Block hidden trackers and spam

Proton Mail automatically blocks hidden pixels in emails that let senders spy on you to see when and where you open their messages. Senders can use these pixels to collect data for personalised advertising, so it's no surprise that Gmail allows them.

Import your Gmail messages into Proton Mail – or auto-forward them to your new inbox to encrypt them.


Set up auto-forwarding from Gmail
3
Import via Easy Switch
Account
Dashboard
Upgrade plan
Recovery
Account and password
Language and time
Appearance
Security and privacy
Import via Easy Switch
Proton Mail
Get the apps
Messages and composing
Email privacy
Identity and addresses
Folders and labels
Set up forwarding
Forward incoming mail from another account to your secure Proton Mail inbox.
Set up auto-forwarding from Gmail
2
Import from Google
Bring your messages, contacts and calendars to Proton.
Import from Google
Import from Yahoo
Import from Outlook
Import from other
1
Import via Easy Switch


Trackers blocked: 1
Links cleaned: 29
30
Trackers blocked: 1
Links cleaned: 29
We protected you from 30 trackers
Learn more
1 tracker blocked
29 links cleaned

Proton Mail automatically blocks hidden trackers in emails.

Proton also removes tracking elements from URLs in emails. This prevents senders from seeing how you interact with their websites when you click those links.

When you receive an email containing tracking pixels or links, a shield icon appears in its top-right corner. Click this to see how many trackers Proton has blocked and the number of links it has cleaned (see screenshot below left).

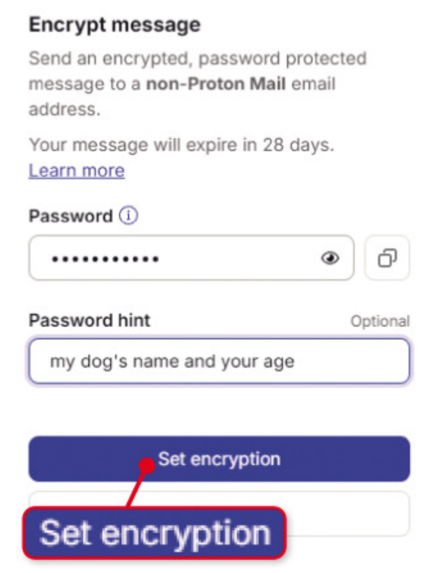
To block an unwanted sender in Proton Mail, such as a spammer or scammer, simply right-click a message from them and choose 'Block sender'. This will reject all their future messages.

Password-protect all of your emails

All emails you send to and receive from other Proton users are protected by end-to-end encryption. But messages to people who don't use Proton Mail are secured using TLS encryption. This encrypts the connection between the sender and recipient, but not the actual messages, which means they're only protected in transit.

To communicate more securely with people who are not using Proton Mail, you can encrypt your emails using a password. Click the padlock icon in the bottom-left corner of a new message window. Type the password you want to use – either share this separately with the recipient or provide a hint to help them guess it – and click 'Set encryption' (see screenshot below).

Your encrypted email will expire in 28 days, after which it is deleted from your Sent folder and the recipient's Inbox, whether they've read it or not. To change the expiry time, click the Edit button, specify the number of days and hours you want, and tick 'I'm sending this message to a non-Proton Mail user'. Click 'Set' to confirm.



Encrypt message

Send an encrypted, password protected message to a **non-Proton Mail** email address.

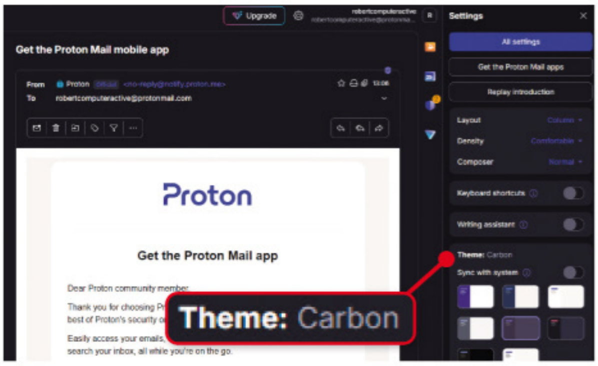
Your message will expire in 28 days.
Learn more

Password: •••••••••••

Password hint (Optional): my dog's name and your age

Encrypt your emails to non-Proton Mail users using a password.

The recipient will receive a message explaining they have an encrypted email from your Proton Mail address, which includes a button to 'Unlock message'. Clicking this will prompt them to enter your password so they can read the content.



You can customise Proton Mail's appearance with different themes.

Download Proton Mail's apps

Proton Mail's free apps for Android (**tinyurl.com/APC551mail**) and iOS (**tinyurl.com/APC551mailio**) encrypt the emails you store on your phone or tablet – and those you send to or receive from other Proton users. Both apps offer most of the same features as the web version, though only the iOS app blocks hidden trackers in messages.

You can set Proton Mail as the default email app on your Android or iOS device. On an Android phone, open Settings and choose Apps then 'Default apps'. Tap 'Email app' or 'Mail app' and select Proton Mail. If you don't see that option, long-press the Gmail icon on your home screen and tap the 'i' icon. Choose 'Open by default' then press 'Clear default preferences'. The next time you tap an email link, select Proton Mail and choose Always to set it as the default mail app.

To do the same on an iPhone or iPad, open Settings and tap Apps then Default Apps. Press 'Email' and choose Proton Mail.

Proton Mail also has a Windows app (**https://proton.me/support/mail-desktop-app**) that you can use as your desktop email client. This is available only with its paid-for plans, but you can try it for free for 14 days.

Customise Proton Mail's interface

Proton Mail offers several ways to customise its interface. Click the Settings button in the top-right corner to open its panel of options. For example, you can switch from the default Row layout to Column, which displays the content of emails to the right of the message list. The Density option lets you choose a more compact layout, and there are eight different themes, which transform Proton Mail's appearance (see screenshot above).

Last year, Proton Mail introduced a private AI-powered writing assistant called Proton Scribe (**https://proton.me/blog/proton-scribe-writing-assistant**), which drafts emails on the subject and in the style of your choice. However, this is currently limited to Proton Duo subscribers (see page 40) so ignore the option to enable the writing assistant.

What else do you get in Proton Mail Plus?

Proton Mail Plus costs $77.88 a year – which works out at $6.49 per month – or $8.19 for one month if you pay monthly.

As well as the features we've mentioned, Proton Mail Plus lets you add up to 10 email addresses. These are technically 'aliases' rather than additional accounts, and allow you to send and receive messages without revealing your real Proton Mail address. If you own a domain name, you can use that in your custom email address.

The free plan lets you create only three folders and labels, and one custom filter, to organise your emails, while the paid-for version is unlimited. Paying customers can also set up automatic replies and send more than 150 messages per day.

Frustratingly, whatever plan you have, Proton Mail limits attachment sizes to 25MB. To share larger files, you'll need to use Proton Drive (see page 39).

Mail Plus also provides 15GB of storage, while Proton Free gives you 1GB by comparison.

MOVE YOUR PASSWORDS TO PROTON PASS

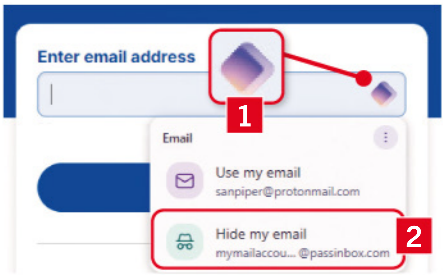
Proton Pass (**https://proton.me/pass**) provides a private and secure alternative to the Google Password Manager. It protects your passwords and other data with end-to-end encryption and stores unlimited logins in both its free and paid-for plans.

Whereas Google's tool only works in Chrome and Android, Proton Pass is available in any browser, on any mobile device and on your desktop through its extensions and apps (**https://proton.me/pass/download**).

Disguise your email address with aliases

Proton Pass protects your email address from spammers and scammers using 'Hide my email' aliases. This means when you sign up for a new account or subscribe to a newsletter, you can use a fake email address to stop your real one being leaked or stolen.

Messages sent to your alias are forwarded to your standard Inbox, where you can reply to them from the fake address. You can create 10 aliases in the free Proton Pass plan, and an unlimited number in the paid-for Plus version. This costs $4.89 a month, or $58.68 for a year.



Enter email address

Email

Use my email
sanpiper@protonmail.com

Hide my email
mymailaccou... @passinbox.com

Protect your email address using a Proton Pass alias.

The easiest way to use aliases is to install the Proton Pass browser extension. This adds an icon to email boxes (1 in our screenshot above) you can click to generate a 'Hide my email' alias 2. You can also create aliases manually by selecting 'Create a hide-my-email alias' in the extension, Proton Pass website or mobile app.

Import and check the safety of passwords

The Proton Pass extension offers to save your login data when you sign up for or into a website – as does its mobile app if set as your default password manager. You can also add passwords manually and import them from an existing password manager.

Proton provides import instructions for different services at **https://proton.me/support/pass/import-export-passwords**. To transfer passwords from Google Password Manager, export them from Chrome as a CSV file. Click the Settings cog in the bottom-left corner of the Proton Pass website, select Import, then Chrome and upload the CSV file.

Once imported, you can check the security of your passwords by clicking Pass Monitor. This highlights weak and reused passwords, and those for which you haven't enabled two-factor authentication. Sadly, Proton's dark-web monitoring is only available in its Plus plan.

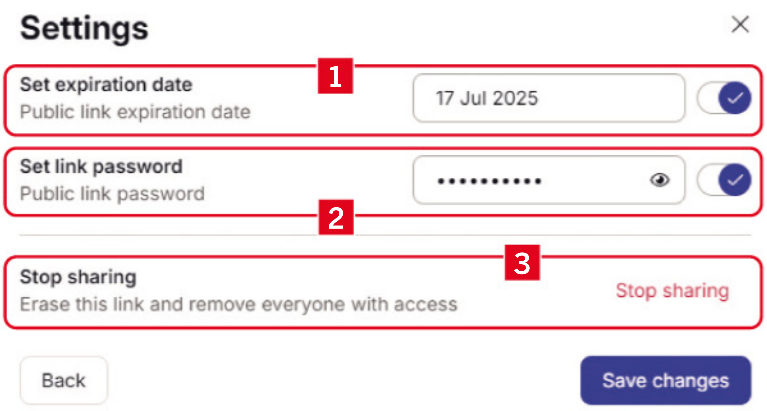
The home of technology

techradar.com

DITCH GOOGLE DRIVE FOR PROTON DRIVE

Proton Drive (**https://proton.me/drive**) is a much more private way to store your files than Google Drive. It doesn't analyse their content using AI, collect metadata about items you upload or comply with government requests to share data.

Most importantly, your files are end-to-end encrypted and only accessible by you. Files in Google Drive are encrypted, but Google holds the encryption keys, so it can decrypt them at any time. Here we outline the best things you can do with Proton Drive.



Settings

Set expiration date
Public link expiration date: 17 Jul 2025

Set link password
Public link password: ••••••••••

Stop sharing
Erase this link and remove everyone with access

Proton Drive lets you share files and folders securely with anyone.

Share files and folders securely

Proton Drive's free plan gives you 2GB of online storage, compared with 200GB in the Plus version. This costs $6.49 a month or $77.88 a year, but doesn't offer much extra aside from recovering all previous versions of files – the free version limits recovery to the last seven days.

You can increase your free storage to 5GB by clicking the gift icon in the bottom-right corner and completing a checklist of actions within 30 days of signing up. These actions are uploading a file, setting up a recovery method and sharing a file or folder securely.

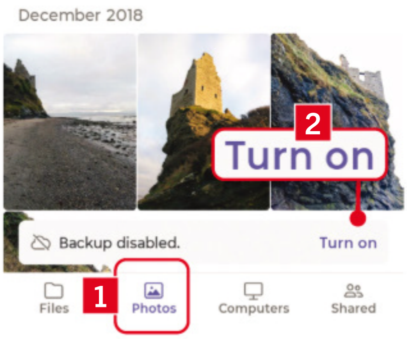
There's no limit on the size of files you can share, and because they're end-to-end encrypted, only the people you share a link with can view their contents. For extra security when you share files and folders with non-Proton users, you can encrypt the sharing link with a password and set it to expire on a specific date.

Right-click an item and choose Share, then switch on 'Create public link'. Click the Settings cog to set an expiration date for the link (1 in our screenshot above right) and protect it with a password 2. Click 'Save changes' to create a public (but private) link you can share however you want. Anyone who clicks the link will need to enter your password to view the content. To deactivate a link before the expiry date, click 'Stop sharing' 3.

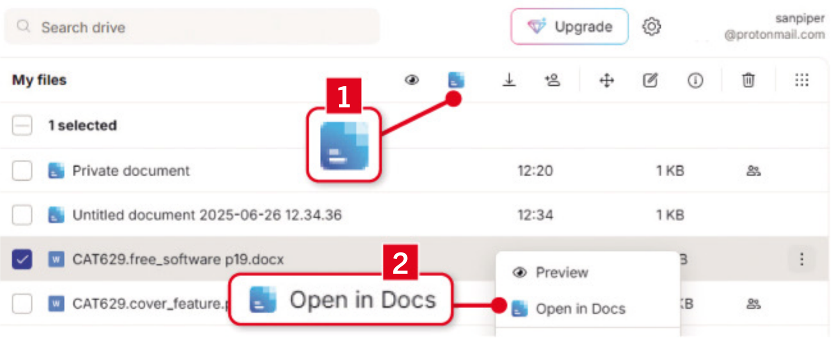
Back up documents and photos automatically

As with other Proton tools, Proton Drive has PC and mobile apps as well as a web version (download them from **https://proton.me/drive/download**). Unlike Proton Mail, you can use its Windows app for free to back up selected folders – such as Desktop, Documents and Pictures – and keep them synced between your computer and online account. Just click 'My computer' in the left-hand menu followed by 'Add folders'.

You can also use the Windows app to import files from Google Drive via Google's Takeout service. See **tinyurl.com/APC551gdrive** for full instructions.



Back up photos stored on your phone to Proton Drive.



Create, edit and share documents securely using Proton Docs.

Proton Drive can back up photos and videos automatically from your phone or tablet. These are end-to-encrypted and have their metadata removed to keep their content private.

To activate this option in the Proton Drive app for Android or iOS, press the Photos tab at the bottom of the screen (1 in our screenshot below left), and turn on backup 2. Once you grant Proton Drive permission to access your photos, it will scan your entire library and back up all the images and videos until you hit your storage limit.

Create and collaborate on documents

Last year, Proton added a Google Docs-style document editor to Proton Drive. As you'd expect, Proton Docs protects the documents you create and edit with end-to-end encryption, to keep them safe from data breaches, online surveillance and AI.

It has the same sharing features as Proton Drive, so you can collaborate securely with other people by sending them a password-protected and time-limited link. Proton Docs includes a choice of fonts, standard formatting options (such as bold, italics, highlights and alignment) and toolbar buttons for inserting images, links and tables. You can download documents in DOCX, PDF and TXT format.

To use it, click the 'New document' button in Proton Drive's top-right toolbar (1 in our screenshot left). You can also edit a document you've uploaded by right-clicking it and selecting 'Open in Docs' 2.

STAY ANONYMOUS ONLINE WITH PROTON VPN

Browsing the web with Chrome leaves you open to all manner of tracking, data collection and personalised advertising – much of it from Google itself. Back in 2020, Google addressed this criticism by launching its own VPN service to "provide an extra layer of online protection". It discontinued the VPN last year, though it's still available on Google Pixel phones – but you're much better off using Proton VPN (**https://protonvpn.com**). Here's why.

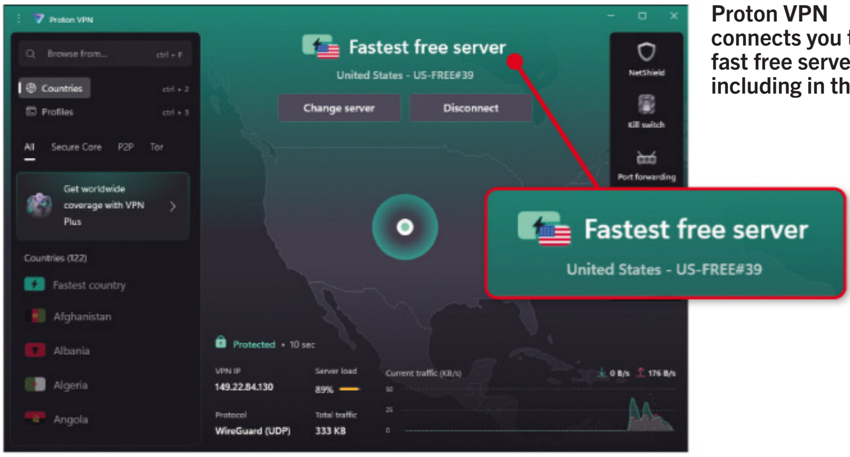
Automatically connect to the fastest server

The free version of Proton VPN automatically connects you to the fastest available free server, so you can browse the web privately and speedily. Servers are located in Japan, Poland, Romania, the United States and the Netherlands.

Although Proton says the nearest server is usually the fastest, it often connects us to a server in the US (see screenshot above right) – handy for unblocking US streaming services. Just click Connect to instantly disguise your location, IP address and activities. Following a recent update, you can also connect by right-clicking Proton VPN's system-tray icon.

Unusually for a free VPN, there's no limit on your encrypted data usage. Proton VPN has a strict no-logs policy, and no ads or trackers.

Its Plus version, which costs $6.48 per month or $77.71 a year, lets you choose from more than 13,600 high-speed servers in 122 countries, including some "optimised for streaming". You can have up to 10 simultaneous connections across your PC, mobile devices, smart TV and streaming stick – get the apps from **https://protonvpn.com/download**.

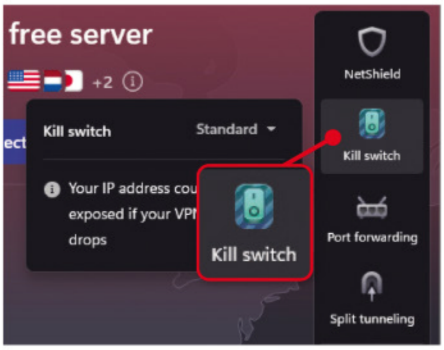

Proton VPN
Browse from...
Countries
Profiles
All
Secure Core
P2P
Tor
Get worldwide coverage with VPN Plus
Countries (122)
Fastest country
Afghanistan
Albania
Algeria
Angola
Fastest free server
United States - US-FREE#39
Change server
Disconnect
NetShield
Kill switch
Port forwarding
Protected • 10 sec
VPN IP
149.22.84.130
Server load
89%
Current traffic (KB/s)
Protocol
WireGuard (UDP)
Total traffic
333 KB

Proton VPN connects you to its fast free servers – including in the US.

Boost your privacy with expert features

Proton VPN's 'Kill switch' automatically disconnects you from the internet when your VPN connection drops. This prevents your IP address and other sensitive data from being exposed – turn it on by clicking 'Kill switch' (see screenshot below) on the home screen and selecting Standard.

A Plus plan includes additional privacy features that make it worth paying for (it's reasonably priced compared with many VPNs). The NetShield tool blocks ads and trackers, while Secure Core boosts protection by routing traffic through multiple servers. Proton VPN Plus also has a 'Tor over VPN' feature that encrypts your data through the Tor network, and offers split tunnelling for excluding certain software and services from VPN protection.


free server
+2
Kill switch
Standard
Your IP address cou
exposed if your VP
drops
NetShield
Kill switch
Port forwarding
Split tunneling

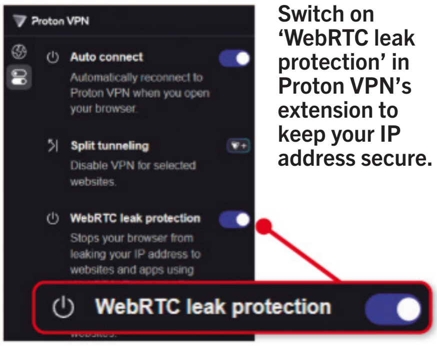
Turn on Proton VPN's 'Kill switch' in case you lose your VPN connection

Use Proton VPN in your browser

Proton VPN's extension for Chromium browsers (**tinyurl.com/APC551vpn**) and Firefox (**tinyurl.com/APC551vpnff**) boosts your online privacy at the click of a button, without you having to open the desktop app. It's particularly useful on public Wi-Fi and can potentially unblock US-only content (if you get connected to a US server).

If you use Vivaldi (**www.vivaldi.com**), you don't need to install the extension, because the browser added Proton VPN earlier this year (**vivaldi.com/protonvpn**). Click the VPN button in Vivaldi's top-right corner and choose 'Already have a Proton Account' to link Proton with Vivaldi.

The built-in Vivaldi tool looks and works just like the Proton VPN extension, with the same restrictions for free users. Both let you switch on 'WebRTC leak protection' (see screenshot below) to stop your browser leaking your IP address – click the Features (sliders) button to find this option.


Proton VPN
Auto connect
Automatically reconnect to Proton VPN when you open your browser
Split tunneling
Disable VPN for selected websites
WebRTC leak protection
Stops your browser from leaking your IP address to websites and apps using
WebRTC leak protection

Switch on 'WebRTC leak protection' in Proton VPN's extension to keep your IP address secure.

Split the cost of a Proton subscription

Last August, Proton introduced a Duo plan to "make online privacy easy for two people" (**https://proton.me/blog/proton-duo**). This gives you and your partner, or a friend or family member, everything in Proton Unlimited, but for a lower price than paying for two separate accounts: $293.88 a year compared with $390.96.

That includes a whopping 1TB of encrypted storage, plus a bonus 15GB every year, and Proton Scribe (see page 37). You get individual logins, so you can keep your Proton emails, files and other data to yourself.

Alternatively, the Proton Family plan (**https://proton.me/family**) offers all Proton's tools to up to six family members, and 3TB of storage (plus an extra 20GB). It costs $441.48 a year.

DITCH GOOGLE CALENDAR FOR PROTON CALENDAR

Proton Calendar (**https://proton.me/calendar**) lets you plan your life more privately than Google Calendar. Unlike that tool, it can't see the titles, descriptions and locations of events, or details of people you've invited to them, and it secures your calendar data with Proton's end-to-end encryption.

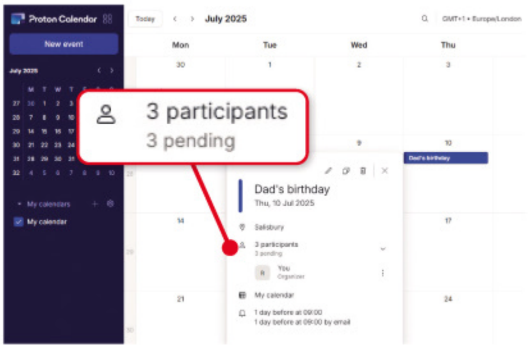
When you sign up for a Proton Mail account, you automatically get access to Proton Calendar and you share your online storage between the two services. Unlike other Proton tools, it doesn't have its own paid-for plan (that's covered by Proton Mail Plus), but it does have free Android and iOS apps (**https://proton.me/calendar/download**).

Add and encrypt events

Adding and editing events is as simple as in Google Calendar. You can specify the time and location, schedule reminders, provide a description and invite participants by entering their email addresses (see screenshot below) – they don't need to be Proton users.

Proton's encryption is applied automatically and also protects events *you've* been invited to and have added to your calendar. Note that to share a calendar, or set up a Zoom meeting, you need to upgrade to Proton Mail Plus.

Proton recently introduced widgets for Calendar's mobile apps. These let you add events and view details of upcoming ones directly from the home screen of your phone or tablet.


Proton Calendar
New event
Today
July 2025
GMT+1 • Europe/London
Mon
Tue
Wed
Thu
3 participants
3 pending
Dad's birthday
Thu, 10 Jul 2025
Salisbury
3 participants
3 pending
You
Organizer
My calendar
1 day before at 09:00
1 day before at 09:00 by email
My calendars
My calendar

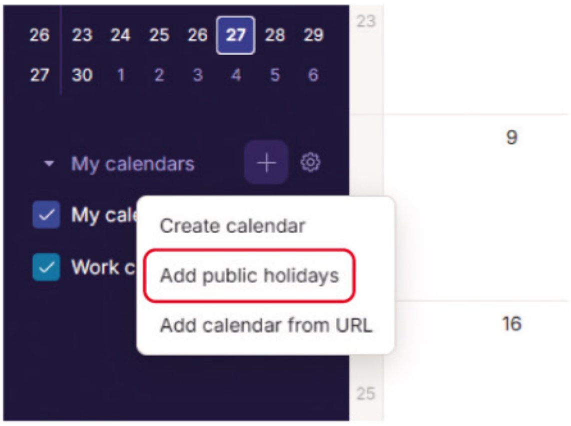
Add events to Proton Calendar and invite people to them, without compromising your privacy.

Secure your existing calendars

You can import and encrypt your Google Calendar using Proton's 'Import via Easy Switch' feature (see page 36). Either tick the Calendar box when you import your Gmail messages to Proton Mail or do it directly in Proton Calendar.

Click the Settings cog top-right, choose 'All settings' and click 'Import/export'. Select 'Import from Google' and grant Proton access to your account. Use the 'Import from ICS' option to import calendars from other services.

Proton Calendar also lets you add and encrypt public and shared calendars. Click the plus sign next to 'My calendars' in the left-hand sidebar, choose 'Add calendar from URL' and paste the calendar's web address. Select 'Add public holidays' (see screenshot above) to show public holidays in your calendar. To add more than three calendars, you need Proton Mail Plus. ■


My calendars
My cal
Work c
Create calendar
Add public holidays
Add calendar from URL

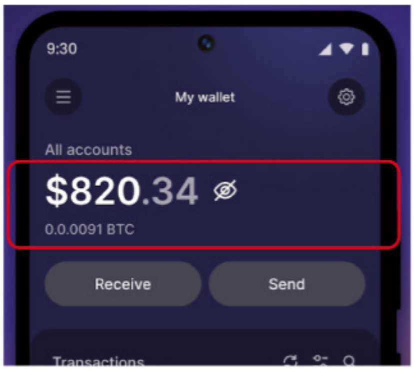
You can include public holidays in your Proton Calendar.

Buy and send Bitcoin securely

Proton's newest tool is likely to be its least interesting for most users: a digital wallet for sending, receiving and buying Bitcoin. But for those who dabble in cryptocurrency, or are tempted to, Proton Wallet (**https://proton.me/wallet**) is a secure and reliable option.

It protects your coins with end-to-end encryption and makes it easy to buy Bitcoin via credit card or bank transfer, through Proton's 'financial partners'. Sending someone Bitcoin is as simple as sending them an email, with no risk of entering the wrong 26-character Bitcoin address.

Proton Wallet gives you two accounts: one for receiving Bitcoin from anyone, and the other for speedier transfers from other Proton users to your Proton Mail email address. You can use Proton Wallet online and via its free apps for Android (**tinyurl.com/APC551wallet**) and iOS (**tinyurl.com/APC551walletio**). Set Australian dollars as the currency when you create your wallet.


9:30
My wallet
All accounts
$820.34
0.0.0091 BTC
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Send
Transactions

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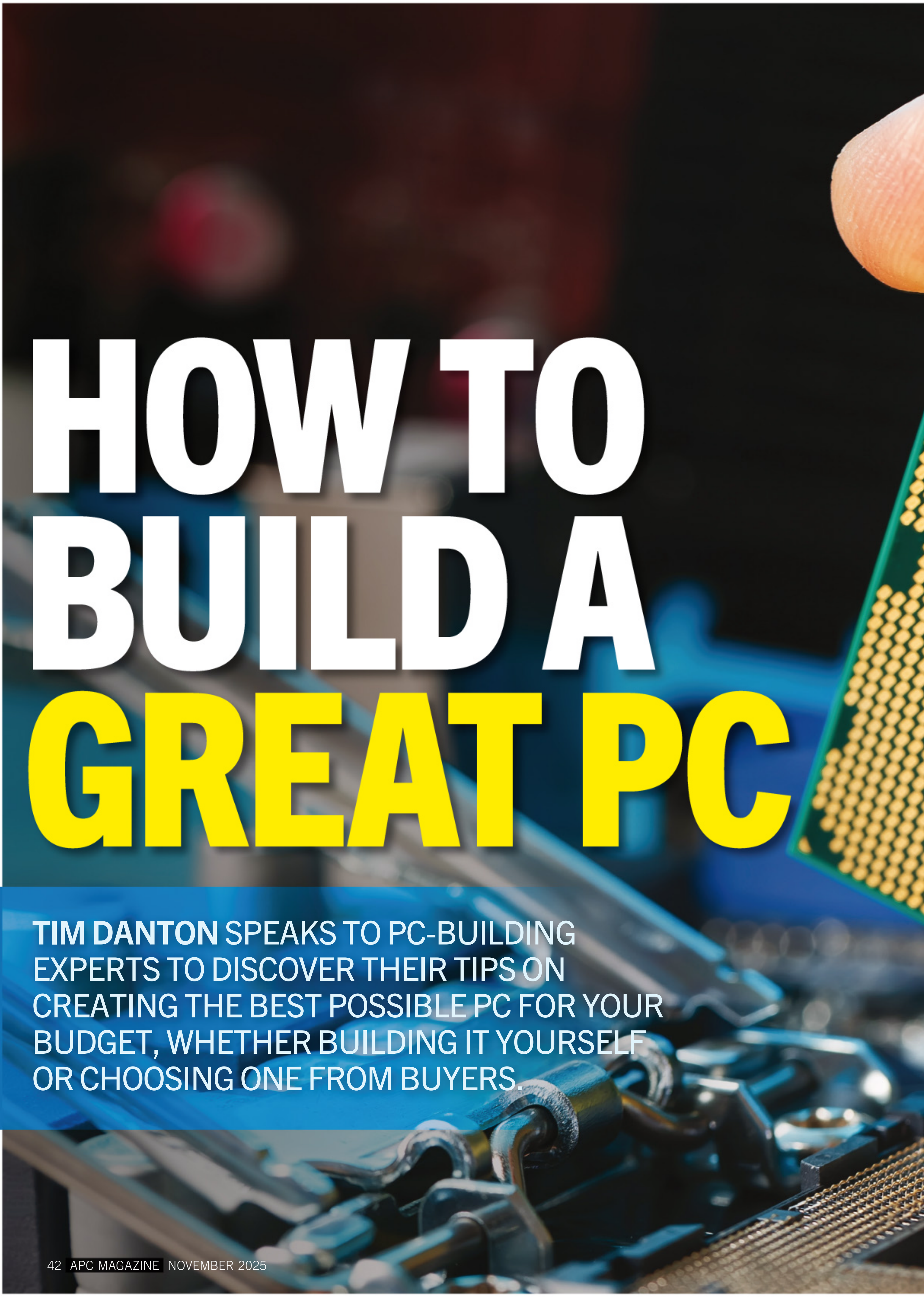
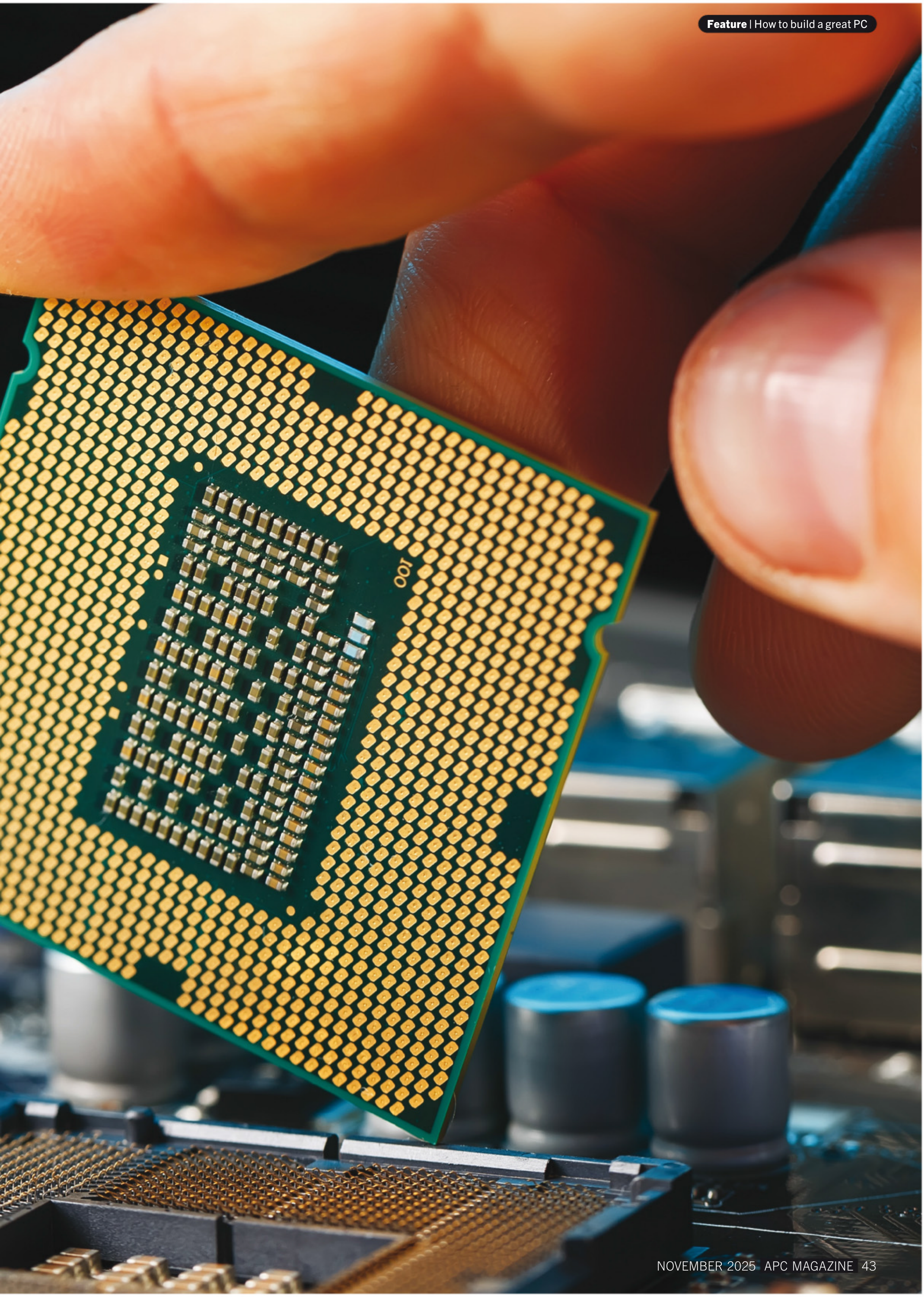
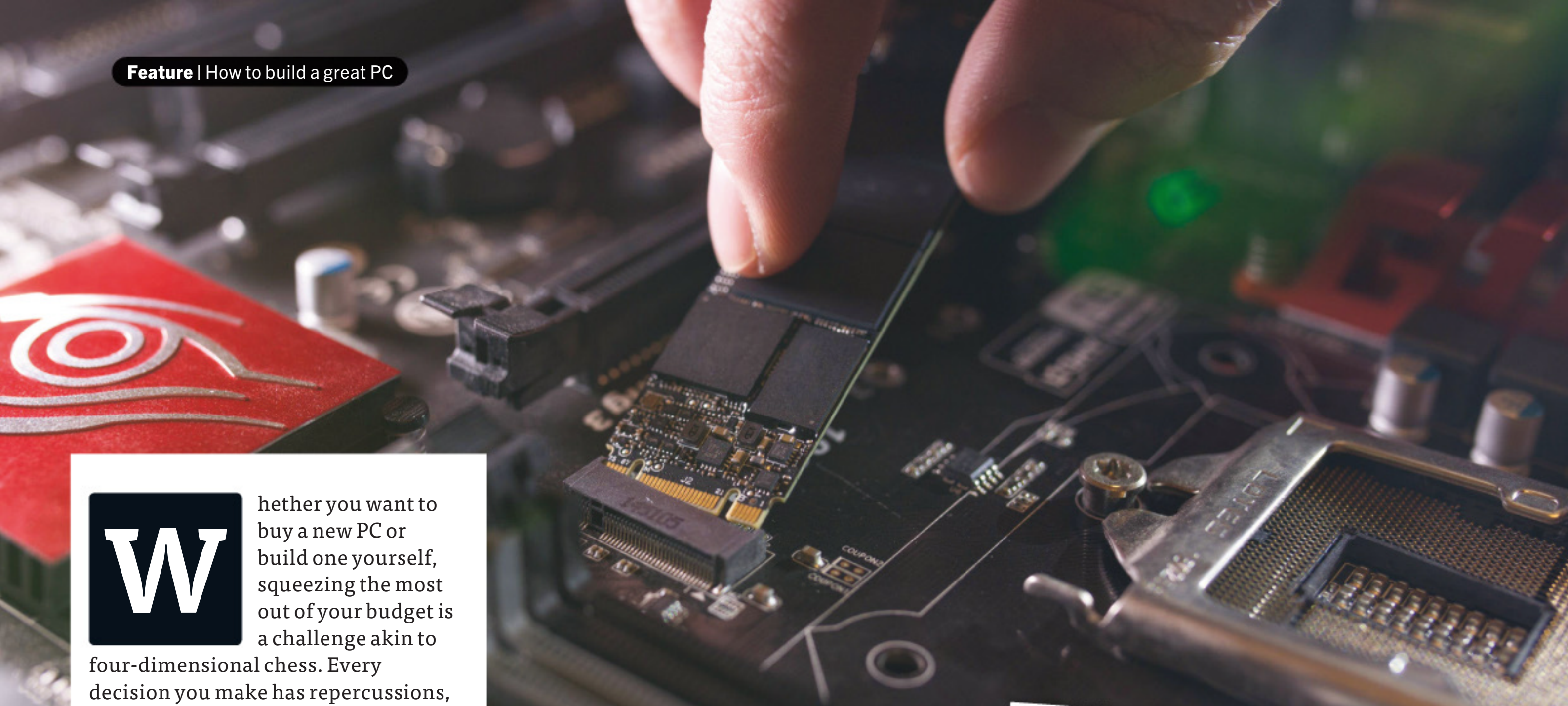


HOW TO BUILD A GREAT PC

TIM DANTON SPEAKS TO PC-BUILDING EXPERTS TO DISCOVER THEIR TIPS ON CREATING THE BEST POSSIBLE PC FOR YOUR BUDGET, WHETHER BUILDING IT YOURSELF OR CHOOSING ONE FROM BUYERS.


OOI

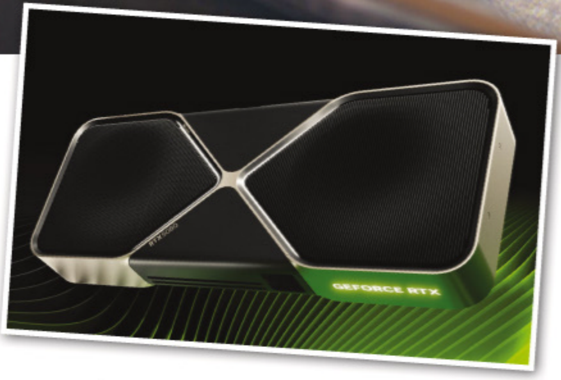


Whether you want to buy a new PC or build one yourself, squeezing the most out of your budget is a challenge akin to four-dimensional chess. Every decision you make has repercussions, some of which may not show themselves until three years down the line. This article is here to help. Based on my own 25 years' experience reviewing desktop PCs, responses from PC vendors and an interview with our very own Lee Grant, I aim to cover the big questions, the pitfalls and squeeze in a few handy tips.

While you can visit sites such as PCPartPicker (**pcpartpicker.com**), which is a great starting point as it does an excellent job of ensuring your parts are compatible, this – like all "configure it yourself" systems – assumes you know roughly what you want already. It reduces our game of chess to two simplistic and manageable dimensions, of price and spec, but lacks soul. There's also the very real risk of either under-specifying or over-specifying.

This guide to buying PCs is also a dog-eared love letter to desktop PCs as a whole. Modern laptops pack phenomenal amounts of power into a tiny space, but if you find yourself computing from the same desk 99% of the time then PCs remain the best choice for value and upgrades. Much like Trigger's broom, if you choose wisely they can morph over the years to the point where virtually nothing remains of your original machine.

ABOVE The big advantage that desktop PCs have over laptops is that they're upgradable.



RIGHT If you're building a gaming rig, it makes sense to spend a lot of your budget on the graphics card.

BELOW Even the fastest gaming laptop can't keep up with a desktop PC with an RTX 5070 Ti inside.

LAPTOPS vs DESKTOP PCS

So let's start with that question: should you buy a laptop or desktop PC? "The beauty of desktops is that they're upgradable," said Lee Grant, who is not only a tech journalist, but runs a computer repair shop with his wife Alison. "They can be fixable. They're the nearest thing you get to sustainable technology."

Away from games, however, a modern laptop may be just as fast as a desktop PC. In recent years the CPUs inside laptops have caught up with their desktop counterparts to a quite incredible degree, and have actually overtaken them in terms of running AI tasks: there isn't a single desktop chip that meets Microsoft's criterion of including an NPU rated at 40 TOPS. And while you can't fit as much storage into a laptop, which usually has a single socket for SSDs, both desktop PCs and laptops have standardised on the M.2 form factor.

Games are a different matter, as Ben Miles from Wired2Fire points out. "Laptops make for great mobile gaming companions, but the form factor isn't as performant, upgradable or aesthetically striking as a good gaming desktop," he said.

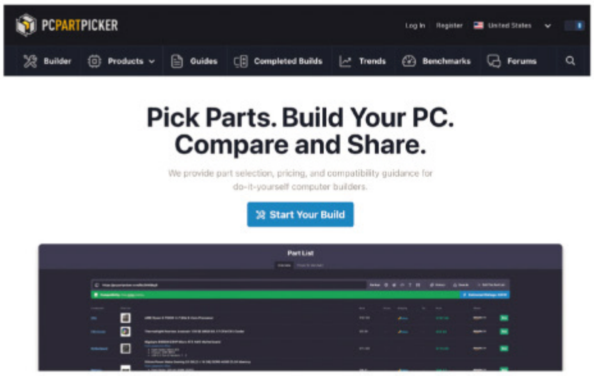
"Mobile versions of CPUs and GPUs have closed the gap compared to desktop variants over the years, but are still hamstrung by power envelopes that get overwhelmed by real-world gaming workloads, even if they can sneak through a typical benchmark run at full speed."

The other key difference is that Nvidia's mobile chips fall a long way short of their desktop equivalents, despite sharing the branding of, say, RTX 5090. "A mobile RTX 5090 is barely as fast as a desktop RTX 5070 Ti," said Ben, "so is quite misleading in terms of its actual positioning in the market. Plus, gaming laptops aren't meaningfully upgradable beyond RAM and storage, and are often loud and uncomfortable to use as a primary gaming device."

THE DIY PC BALANCING ACT

So, let's assume that you're persuaded by Lee and Ben's arguments and that you want to buy a desktop PC. The next big question is how you set about choosing the various components. The processor, the motherboard, the memory, the graphics card, the chassis, the amount of storage?

"The most commonly asked questions we receive are usually regarding what performance [you can



Pick Parts. Build Your PC. Compare and Share.

We provide part selection, pricing, and compatibility guidance for do-it-yourself computer builders.

ABOVE Sites such as PCPartPicker assume you already know roughly what you want .

DON'T WASTE CASH!

If you find you simply can't build the right PC for your budget, how do you make sure you trim in the right places? "Performance first, aesthetics later," said CyberPowerPC's Dave Gornall when we asked him this question. "There are many different ARGB, LCD and OLED options out there, from cases to fans to coolers and even motherboards, but these usually come with a premium price. Make sure the core components of the PC meet expectations first, before spending a ton of money on cosmetic upgrades. These can usually be upgraded down the line, but having a strong, well-performing PC is the most important thing."

Wired2Fire's Ben Miles points out that some customers decide to save money on the monitor and peripherals, which in his view is the most foolish decision of all. "There's no point in having an RTX 5090-based PC plugged into a 1080p or even 1440p monitor, yet we see this time and again," he said. "Likewise, a premium setup demands a premium keyboard, mouse, monitor and headset. Not Amazon specials. Within the build itself we often see bargain-bin system builders coupling five-year old processors with modern GPUs... this creates dreadful bottlenecks and poor performance, not to mention limited upgrade potential."

get for a budget] on a given game or set list of games, or in relation to streaming or content creation," said Dave Gornall of CyberPowerPC.

"For example: 'I would like to achieve 165Hz at 1440p on *Warzone*, what is the best streaming system you can build for me under $3,000?' Which we would usually ask for more information on other use cases to make sure we're checking all of the boxes, before offering a selection of different specifications within the budget (for example, an AMD CPU spec, an Intel CPU spec, both short of and at the higher end of the budget)."

Ben gave a similar reply. "Our most often asked question is 'what do I need to run X smoothly?', where X could be any game, application or simulation the customer is passionate about. It's very easy to spend money unwisely on PCs and end up with a spec that is grossly over-specified in the wrong area. A 64-core Threadripper, for example, might be incredible for video encoding, but is bested by a simple Ryzen 7 costing 90% less money for gaming.

"The key is balance," he continued. "If you overcook one component at the expense of another, you'll end up with a bottleneck in the usability and overall performance of the device. Wired2Fire would never, for example, couple a Ryzen 9 or Core Ultra 9 CPU with an entry-level motherboard, as the power phases in the board would be overwhelmed and aggressively throttle the clock frequency." For the sake of balance, I should point out that I'd be shocked if any reputable PC manufacturer did this. "Likewise, you can totally hobble the performance of a powerful GPU if the CPU, RAM or cooling is not up to the standards set by that component."

So how should you split your budget? "There are no rules of thumb that fit every user's scenario," said Ben, "but it's a generally accepted truism that 40-50% of your total PC budget should go on the GPU for a premium gaming system. It's the most expensive component and has the largest impact on the frame rate you'll experience. The art is in balancing the remainder of the budget to rule out any bottlenecks caused by poor combinations of the motherboard, CPU, case and cooling components."

We'll come back to how to balance the rest of your budget in a moment.

BELOW Tailor your components to the tasks you'll be doing every day.

3D Modeller 2R
Project 324 / Scene 4 - File.3dm
Tools
Modificators

THE ADAGE OF 'BUY CHEAP, BUY TWICE' APPLIES TO PCs MORE THAN ALMOST ANY OTHER PURCHASE

ABOVE The AM4 platform has given users confidence that AMD will support a standard for years to come.

IN THE 'MONEY NO OBJECT' CATEGORY, AMD X3D PROCESSORS HAVE A CLEAR ADVANTAGE OVER INTEL

A PC FOR MORE THAN JUST GAMING

While gaming is clearly a big focus for many buyers, it isn't the only one. When Lee talks to customers who want him to help specify and build a computer, he starts with the basics: "What are they going to use it for? What do they use their current machine for? What software packages are key?

"You get your generalists who just want an everyday machine, and then you get the people that say, 'Oh, I use it for this', whether that's AutoCAD, Lightroom, whatever. If it's a gamer, I find out which games they love to play. You need a hook to start with, because very often people come to me because they don't understand whether it's an AMD or an Intel, and they don't care."

"Use case of the PC is the most important," said CyberPowerPC's Dave Gornall, "as it allows us to make informed decisions on component selection, and an idea of what the user wants to achieve. However, budget is also important as it allows us to develop an expectation of how the system will operate given requirements."

While budget is important, don't tie yourself down too exactly: you should have a ballpark figure, which you then use (either with the help of websites such as PCPartPicker or using the experts on-hand at PC manufacturers) to determine what level of processor, motherboard and graphics card you can afford. After that cornerstone is in place, everything else should follow without stress.

But there's one more thing to consider: your budget may be too low. "The adage of 'buy cheap, buy twice' applies to PCs more than almost any other purchase, but careful component choices can yield surprisingly good performance in most applications from modest budgets," said Ben. "The key is to set realistic expectations when you plan your build; $2,000 won't get you a Triple-A 4K gaming monster, but it will certainly allow you to enjoy all current releases at more modest settings that still blow away console alternatives."

AMD vs INTEL

Next we asked about the ongoing battle between AMD and Intel on the processor front, and AMD versus Nvidia for graphics cards. What would you recommend at the moment?

"In the 'money no object' category, AMD X3D processors have a clear advantage over Intel alternatives for gamers, and anyone spending upwards of $4,000 should really accept no substitute," said Ben.

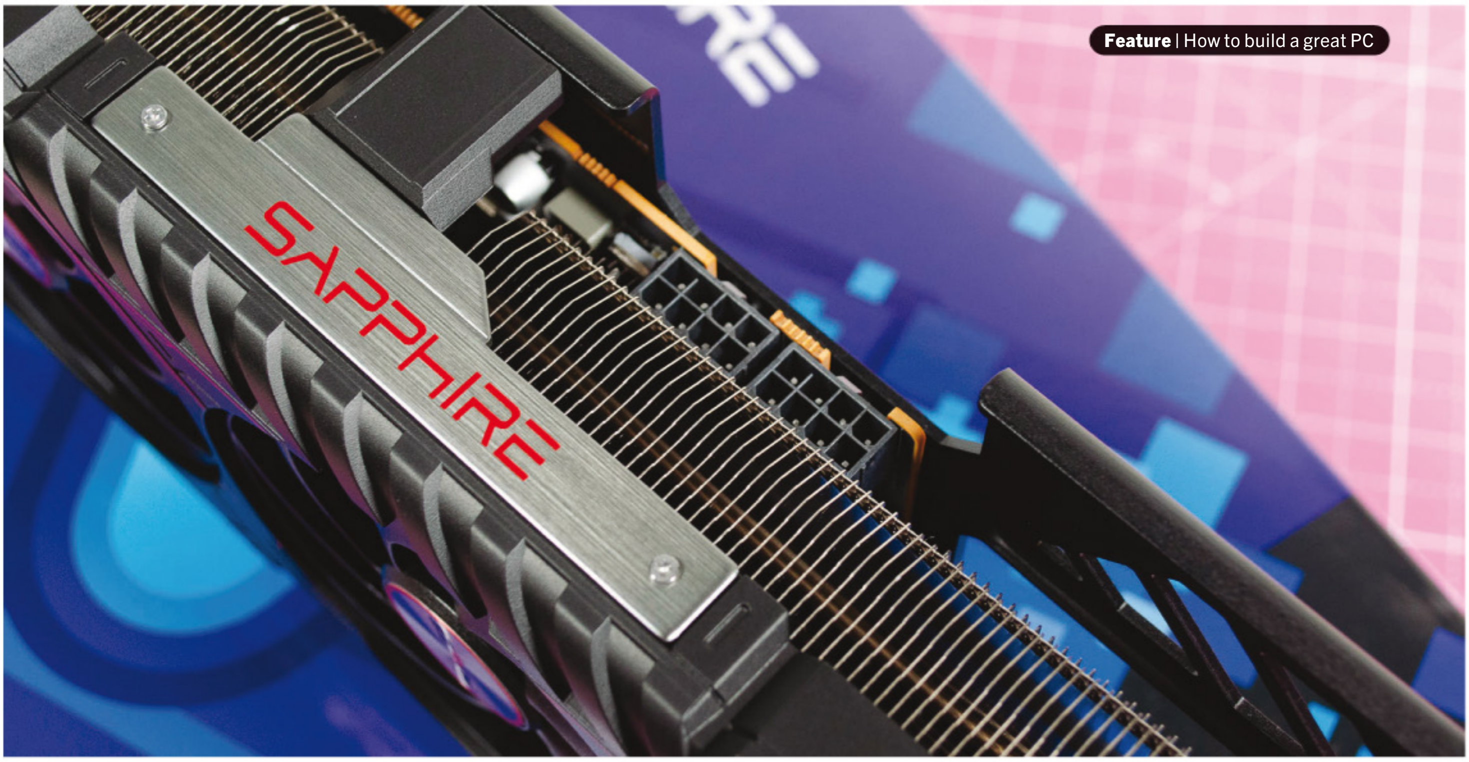
"In the HEDT [high-end desktop] space, AMD Threadripper has ruled supreme for many years now with barely any competition." If you need any evidence of this, simply turn to our group test of content-creation workstations from p76.

Away from the high end, things are more balanced. "Intel and AMD trade blows for the best performance per dollar spent," said Ben. "What steers us towards an unequivocal AMD recommendation is its long-term commitment to supporting socket platforms, and processors that don't have a recent history of suddenly dying. We used to say 'there's no such thing as

AMD AM5 CHIPSETS COMPARED

CHIPSET	TYPE OF BUYER	PCIe 5.0 GRAPHICS?	PCIe 5.0 SSD?	TOTAL PCIe LANES	TOTAL PCIe 5.0 LANES	CPU OVERCLOCK?	DDR5 OVERCLOCK?	USB 3.2 GEN 2 (MAX)	USB 3.2 GEN 2X2 (MAX)	USB4	SATA PORTS (MAX)
X870E	Enthusiast+	✓	✓	44	24	✓	✓	12	2	✓	8
X870	Enthusiast	✓	✓	36	24	✓	✓	6	1	✓	4
B850	Mainstream+	✗	✓	36	4	✓	✓	6	1	Optional	4
B840	Mainstream	✗	✗	34	0	✗	✓	2	0	Optional	4
X670E	Enthusiast+	✓	✓	44	24	✓	✓	12	2	Optional	8
X670	Enthusiast	✗	✓	44	8	✓	✓	12	2	Optional	8
B650E	Mainstream+	✓	✓	36	24	✓	✓	6	1	Optional	4
B650	Mainstream	✗	✗	36	0	✓	✓	6	1	Optional	4
A620 / A620A	Budget	✗	✗	32	0	✗	✓	2	0	Optional	4

Please note that motherboards will have their own limitations so check before buying



ABOVE **AMD's RX 9000 cards have earned praise for their value.**

a bad processor, only a bad price', but the 13900K and 14900K debacle proved that to be untrue."

Ben is referring to a bug that caused instability and crashes – in some cases, meaning the processors were actually damaged – until Intel issued microcode updates in August and September last year. "A lot of gamers have been turned away from Intel because of that," said Lee.

Historically, AMD also provided better value overall thanks to the cost of its package: not only the CPU, but the motherboard and memory. This advantage isn't as clear cut since both Intel and AMD switched to DDR5 memory, however, and away from high-end gaming machines Lee doesn't believe that either brand holds a big advantage.

On the morning we chat, Lee has two Intel-based machines sitting ready to be built behind him, but he says this is unusual. "I think the graphic performance of the Radeon graphics in AMD's desktop chips far outstrips Intel's, so I tend to go with AMD. The other thing that has been historically very good is the power of the AM4 chipset. I've got another machine here which is AMD AM4, and there's a load of parts coming today to modernise that." While AMD has established a great reputation for supporting its chipsets long-term, the same can't be said for Intel, which has chopped and changed in recent years.

ASUS
PRIME X870-P WIFI
M.2
M.2

BELOW **Before you spend hundreds on a motherboard, read its manual to understand what it can and can't do.**

AMD vs NVIDIA

"The video card question is by no means as clear-cut as it was a few months ago," said Wired2Fire's Ben Miles. "The market has been very lukewarm towards Nvidia for the 50-series launch, with most media outlets accusing Team Green of very lacklustre generational performance uplift and an overreliance on frame-generation technologies. AMD, by contrast, has seen a hugely positive response to its 9000-series releases thus far, with considerably better ray-tracing performance and value than previous generations."

AMD is essentially reaping rewards for its focus on low to mid-end GPUs, seemingly happy (for the moment, at least) to leave the high end to Nvidia. If you want 4K gaming at top settings, then your choice boils down to the RTX 5080 and 5090, which "reign uncontested" said Ben. "Outside of that race, there is a very real AMD threat to Nvidia's dominant market position."

CHOOSING THE RIGHT MOTHERBOARD

One area where it's incredibly easy to become unstuck is the motherboard. The manufacturers don't help by producing such a staggering number of options, so you need to find a way to produce a shortlist that matches your needs.

First, that means choosing the right chipset. Let's assume for a moment that you're going down the AMD AM5 route. That means you have nine chipsets to choose from, as detailed in the table opposite. Ultimately, you need to do your own research to find out what the differences mean. Unfortunately, PCPartPicker doesn't allow you to filter by chipset, but the Wi-Fi option provides a great proxy (assuming you want built-in Wi-Fi). For example, choosing Wi-Fi 7 means you'll mostly see high-end X870E, X870 and B850 options.

Thinking about your storage demands also helps. As you go up AMD's range, you'll see more support for more PCIe lanes. A graphics card grabs 16 immediately, while an SSD typically needs four. So the more storage you add (including via SATA connectors), the more lanes you require.

"Firms have never been very good at explaining exactly what happens if I plug in, let's say, four SATA drives – does that knock out one of the M.2 slots?" said Lee. "You only discover that sort of stuff by reading the manual. You have to research. I spend a lot of time reading manuals, particularly if

I'm building something difficult."

Memory choices are much simpler. Both AMD and Intel have shifted to DDR5 RAM, and your choice of motherboard dictates the speed of memory supported and how many RAM slots there are. RAM is almost always sold in pairs as you need two to take advantage of the dual memory channels supported by mainstream desktop processors and chipsets.

How much memory you need depends on usage, but these days it makes little sense to choose less than 16GB in total. If you intend to stream while you game, however, then 32GB is a wise aim.

GEFORCE RTX
SPY×FAMILY
LIAN LI
UNI FAN SL-I
DAN CASE B4

ABOVE The Lian Li V200 chassis looks stunning – so don't shove it in a corner.

CHASSIS AND THE PSU

Choosing a chassis is a hugely subjective decision, so I won't attempt to pre-empt your preferences. What I will say is that there's no point in buying the flashy, RGB-heavy designs if your PC is going to sit out of sight. Which may sound obvious, but it happens. "People get these glass fish tanks now, but the machine's sitting in the corner on the floor in the corner where no-one's ever going to see it, and it's got dayglo lights on it that have cost a fortune," said an exasperated-sounding Lee.

You should also make sure you choose the Goldilocks size of case. I've reviewed PCs with huge, space-consuming cases but a microATX motherboard that barely takes up a third of the available space. Go too small and it becomes a nightmare to replace components or add more memory or storage. Again, sadly, you'll have to do your research – which doesn't necessarily mean watching YouTube videos. "People look at YouTube influencers, not realising the influencer has probably been sent that machine by Cooler Master or whoever, and they haven't built it at all," said Lee.

Fortunately, reputable chassis makers provide all the information you need on their websites, including how many 2.5in and 3.5in disks can be accommodated, and where they go (I like them to hide out of sight behind the right-hand panel), plus the type of cooling systems that are supported.

When it comes to power supplies, don't fall into the trap of thinking bigger is always better. "Over-specifying power supply units is a common mistake," said Lee. "I've seen PCs with an Intel Core i3 and a 1,200W PSU. People think, the more wattage, the quicker the machine: I need to upgrade my power supply for it to be faster, right?"

Obviously as a reader of *APC* we wouldn't expect you to fall into that trap, but it's one of the areas where PCPartPicker is a great aid as it will show PSUs with the minimum power

WHEN IT COMES TO POWER SUPPLIES, DON'T FALL INTO THE TRAP OF THINKING BIGGER IS ALWAYS BETTER

SELF-BUILD MISTAKES

We asked our experts what common mistakes people make when building a PC. "Buying incompatible components is very easy, as you often need to think beyond simply 'what chip goes in what board'," said Ben Miles of Wired2Fire. "Many combinations of parts don't work when used in unison – for example a video card and a cooler might both be compatible with a particular case in isolation, but not when used together. This is where experience and up-to-date component knowledge is key.

"In the build itself, the most common error we see is novices screwing the motherboard directly into the case without installing standoffs first, and forgetting to remove the plastic protective sheet from the base of a CPU cooler," Ben added. "And of course, TOO MUCH PASTE!!!" This refers to the common mistake of first-time PC makers who plaster too much thermal paste onto the processor (although others add too little).

Lee Grant pointed to "people missing out the value in desktop PCs, which is the upgradability potential. People don't think long term. I've got cases out there that I've been working on for 20 years. The insides are all different. It's like Theseus' ship: who knows if it's still the same machine? If you buy a nice case – and I'm a big fan of Be Quiet! – that thing can last and last and last. And you can just rip things out, shove things in."

People also need to beware of assumptions, such as that wireless is built in. "That surprises a lot of people, when it's not included," said Lee. "And if you're one of those people who keeps your machine on the floor, make sure you get a wireless card that's got external antennas connecting over wire rather than an integrated receiver, because that will be a big help."

ABOVE Follow the manufacturer's guidance when applying thermal paste as it's easy to add too much.

CUSTOMERS BUY WATER COOLERS OR LIQUID COOLERS, NOT REALISING THERE IS A LONGEVITY WITH THOSE THINGS

ABOVE Liquid-cooled PCs aren't necessarily quieter than air-cooled ones.

options. You may want to add 100W to give your system room to grow, however.

STAYING COOL AND FAN NOISE

How do you ensure that a PC isn't too noisy? "Careful component choice comes first – you need to make sure your cooling hardware isn't going to be overwhelmed by the rest of the parts, as this will invariably result in fans running at full tilt to compensate," said Wired2Fire's Ben Miles. "Choosing sensibly RPM-limited fans also means the PC won't be too loud, even if they do run at full speed. Don't underestimate the importance of sympathetic vibrations and resonance – it's easy to undo good cooler choices with a rattly fan screwed directly to the metal chassis."

As CyberPowerPC's Dave Gornall points out, though, noise is a subjective issue. "[It] depends on the use-case scenario; however, only using high-quality fans that have PWM control is pivotal as it allows the end user to have full customisation of the fan volume. Having a less aggressive fan curve can reduce the audio output without any detriment to performance."

It may surprise some readers that often the quietest PCs we review in *APC* are the ones with the highest number of fans. Much of that is due to the skill and knowledge of the builders, who understand exactly how the air flows in the chassis. Nor should you imagine that a liquid-cooled PC is always quieter than an air-cooled one: the main purpose of liquid cooling is to provide more efficient cooling by using liquid to suck heat away, and then cool the liquid using a separate batch of fans. In fact, liquid coolers normally add to the number of fans in a system.

Anyone building such a system should tread carefully, heeding the words of PC repairer Lee. "Customers buy water coolers or liquid coolers, not realising there is a longevity with those things," he said. "And you need to keep an eye on them, because they do leak and they do destroy systems' power supply units."

Our final word on the physical side of building a PC is about the related subject of cable management. How important is good cabling? "It sets apart a professional build from an amateur build," said Ben. "All PCs built by a manufacturer willing to ship and warranty a PC should have impeccable cable management. Good cable management isn't just about aesthetics – it can transform thermals as well. A key skill when building a PC is to balance airflow in and out of the case, and ensure air is moving in logical directions over key hot spots."

BELOW Good cable management sets a professional build apart from an amateur one.

GIVE IT A GO!

If there's one lesson to learn from our experts, it's that building a great PC isn't easy. But that doesn't mean you shouldn't try it yourself. "Give it a go, but do your research first and don't expect it to be 100% plain sailing," said Wired2Fire's Ben Miles. "If it doesn't power on first go, stay calm, don't panic and seek advice."

My one word of warning is that you shouldn't necessarily expect to save a lot of money. You can save a small amount, but your PC won't include the warranty or the reassurance of an expert at the end of a phone line if strange noises start appearing after six months. Also be aware that, unless you go down the Linux route, you'll have to pay for a Windows licence.

Like Ben, Lee encourages people to try building systems themselves. "Our business is called Inspiration Computers, with our idea – 20 years ago – that we would inspire people to do more with their computer. That includes building them," he said.

"It's about just encouraging people to have a go, because that promotes sustainability, because it encourages things people to think, 'I can fix this, I don't have to go out and buy a new PC'. You know, it's not a big, scary thing: PCs are a lot easier to build than they used to be. It's only when it becomes more complicated with LED lights, water coolers and multiple fans that it becomes challenging. Yet these very basic machines sitting behind me will be running in 15 minutes, because it's absolutely child's play. So I encourage everyone to have a go." ■

50 BEST WAYS AI WILL IMPROVE YOUR LIFE

AI can do much more than answer quick questions and generate quirky images. **Robert Irvine** recommends 50 AI tools with practical benefits for your life in the real world.

Artificial intelligence is no longer just a geeky or gimmicky technology – it's becoming integrated with our daily lives. Although not everyone welcomes this development – there are valid concerns about AI replacing human jobs, collecting our data and 'hallucinating' misleading information – AI is clearly here to stay.

Outside of the chatbots we have previously tested, AI is now embedded in all kinds of websites, apps and devices. You probably use AI already without realising – for example, when extracting text from images using OCR or interacting with Alexa using voice commands.

Some uses for AI are undoubtedly trivial and even cynical – as unintentionally demonstrated by the Microsoft executive who advised laid-off workers to turn to AI tools for emotional support. But the rapidly evolving technology also has the potential to improve our lives in many meaningful ways.

In this feature, we reveal 50 of those ways, spanning a wide range of purposes and practical benefits. We've tested hundreds of AI tools to bring you the best examples of how they can transform your life and save you money, time and hassle. Some of our advice is for ChatGPT and Gemini, but we also explain how to use lots of innovative and useful new tools.

WHAT YOU CAN DO

- Save money on shopping and bills
- Make all journeys faster and safer
- Improve your health and fitness
- Get assistance with your hobbies
- Create & enhance images & videos
- Upscale your TV picture and sound
- Make tedious admin tasks easier
- Manage your home more efficiently

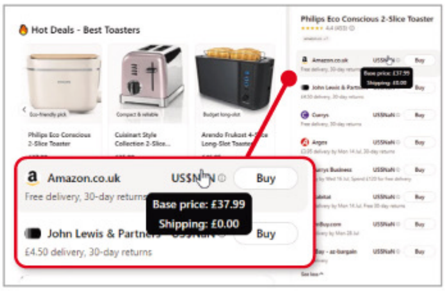
AI TOOLS THAT SAVE YOU MONEY

1 Find the best deals when shopping online

ChatGPT now includes shopping features that recommend products and where to buy them when you enter shopping-related queries – for example 'best deals on toasters' or 'Android phones under $400'. These results show a carousel of matching products and summaries of 'top picks'.

Click a result to compare the price of the item at different online stores (see screenshot below). ChatGPT says it selects items independently and its suggestions are "not ads".

Google now uses Gemini to find you cheap products through its Shopping service (**www.google.com/shopping?udm=28**). Its new AI Mode more tightly integrates the two to let you perform conversational shopping searches and track price trends, to discover the best times to buy (**tinyurl.com/APC551shopping**). AI Mode is currently limited to the US and India, but is coming to Australia very soon.


Hot Deals - Best Toasters

Philips Eco Conscious 2-Slice Toaster

Cuisinart Style Collection 2-Slice...

Arendo Frukost 4-Slice Long-Slot Toaster

Philips Eco Conscious 2-Slice Toaster

Amazon.co.uk US$NaN Buy

Free delivery, 30-day returns

Base price: £37.99

Shipping: £0.00

John Lewis & Partners US$NaN Buy

£4.50 delivery, 30-day returns

ChatGPT now recommends the best current online deals on products.

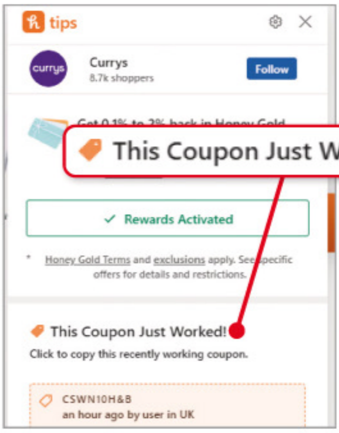
2 Save money on premium shopping

The AI-powered Google Lens feature in the Google and Gemini apps for Android and iOS lets you take photos of products you see on the high street – or scan their barcodes – to check if you can buy them for less at another store. Its answers may also include direct links to the deals.

Amazon offers a similar AI feature called Amazon Lens in its Android and iOS apps. Tap the camera icon in the search box, then take a photo of a product, upload an image or scan a barcode. Amazon will search its store so you can see if the item (or a similar product) is cheaper there.

3 Apply discount codes automatically

PayPal's popular discount-finding tool Honey (**www.joinhoney.com**) uses AI to find voucher codes for the site you're visiting, test if they work (see screenshot above) and apply them automatically at the checkout. It also alerts you when the price of the product you're viewing has dropped, and lets you add items to a Droplist to monitor their prices.


tips

Currys

8.7k shoppers

Follow

This Coupon Just Worked!

✓ Rewards Activated

* Honey Gold Terms and exclusions apply. See specific offers for details and restrictions.

This Coupon Just Worked!

Click to copy this recently working coupon.

CSWN10H&B

an hour ago by user in UK

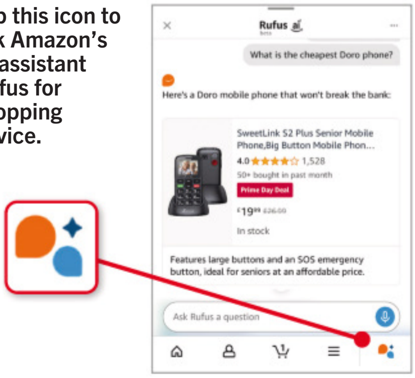
Honey uses AI to find and apply discount codes that work.

4 Ask Amazon for shopping advice

Amazon's app now has its own AI assistant, Rufus, which answers your shopping questions and recommends specific items for your budget. To use the chatbot, press the Rufus button in the bottom-right corner of the app – this looks like orange and blue speech bubbles (see screenshot below). Type a query into the message box, or press the microphone button to speak one, and Rufus will provide a detailed response.Select one of the follow-up questions or type one of your own. Rufus bases its responses on Amazon's product details, customer reviews and community Q&As.

Argos has also introduced an AI chatbot, Ask Trevor (based on its dinosaur mascot). It's currently only available on the Argos website – not in its mobile apps.

Tap this icon to ask Amazon's AI assistant Rufus for shopping advice.


Rufus

What is the cheapest Doro phone?

Here's a Doro mobile phone that won't break the bank:

SweetLink S2 Plus Senior Mobile Phone,Big Button Mobile Phon...

4.0 ★★★★☆ 1,528

50+ bought in past month

Prime Day Deal

£19.99

In stock

Features large buttons and an SOS emergency button, ideal for seniors at an affordable price.

Ask Rufus a question

5 Get money-saving tips and news

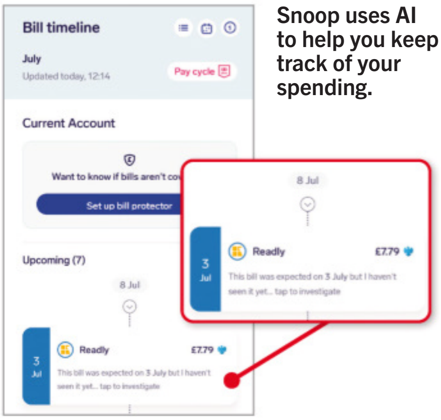
Money Saving Expert (MSE, www.moneysavingexpert.com) is an excellent source of financial advice but finding specific information in its sprawling guides sometimes takes a while. To make life easier, its mobile app now has an AI-powered 'personal finance information chatbot' that searches MSE's articles and news stories to answer your money-saving questions. Tap the search button in the top-right corner of the app to access 'MSE Search (with AI)'.

6 Track and reduce your spending

The free app Snoop (**tinyurl.com/APC551snoop**), uses AI to help you track your spending, manage your bills, set monthly budgets and calculate how much you should save.

Connect your bank and credit-card accounts (Snoop can't see your login information) to get an overview of your finances (see screenshot below) and view money-saving deals.

Some features – such as exporting transaction data – are limited to Snoop's Plus plan, which costs $6.49 a month after a seven-day free trial.


Bill timeline

July

Updated today, 12:14

Pay cycle

Current Account

Want to know if bills aren't co

Set up bill protector

Upcoming (7)

8 Jul

3 Jul Readly £7.79

This bill was expected on 3 July but I haven't seen it yet... tap to investigate

Snoop uses AI to help you keep track of your spending.

7 Boost your savings automatically

Trusting AI to take money from your bank account sounds risky, but Plum (**withplum.com**) offers a smart and safe way to boost your savings. Its 'Auto-magic' algorithm calculates what you can set aside each week and transfers that amount to your Plum savings account or ISA. The app also uses AI to round up all your transactions to the nearest pound and adds the 'spare change' to your savings.

TRAVEL MORE SMOOTHLY & SAFELY

8 Discover the fastest and cheapest routes

Ask ChatGPT or Gemini the cheapest or fastest way to get from A to B, and they'll present you with a detailed breakdown of your travel options. This may include the price of coach, train and bus fares; fuel costs and toll charges if you're driving; the total distance and average journey times for each option; and extra advice such as whether to book advance tickets.

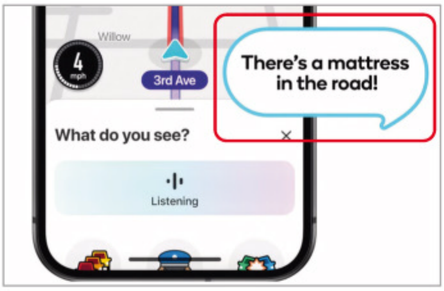
You can then ask follow-up questions about how busy and frequent public transport is likely to be; the earliest and latest times you can travel; if stations have step-free access; and anything else that's relevant to your trip.

9 Get up-to-date driving information

Google Maps and Waze (**www.waze.com**) combine AI with real-time data from their users to provide accurate and up-to- date driving information. They factor in if heavy traffic, road closures or bad weather will affect your journey, and suggest alternative routes.

Waze also uses AI to verify the reliability and relevance of its users' road reports. It is rolling out a Gemini-powered Conversational Reporting feature that makes it easier to submit reports using natural language (see screenshot below).

Gemini also powers the new Ask Maps feature in Google Maps, but this is currently only available in the US.



There's a mattress in the road!

What do you see?

Report hazards in the road to Waze more naturally using AI.

10 Avoid accidents while driving

Many new cars now come with ADAS (Advanced Driver Assistance Systems) features, which use AI to help prevent accidents. ADAS can recognise pedestrians, objects and cyclists; detect driver drowsiness and distraction; and warn you of collision risks.

Botslab
4K AI-Enhanced Camera

Add ADAS features to your car with an AI dashcam.

If your car doesn't have ADAS built in, you can add AI features with a high-end dashcam such as the BotsLab 4K AI-Enhanced Camera ($199 from **tinyurl.com/APC551botslab**, pictured above). Alternatively, install the free app Magic Earth (**tinyurl.com/APC551magic**) on your Android phone. This includes an AI Dashcam component with ADAS features that help you avoid collisions and accidents.

11 Claim refunds on delayed rail journeys

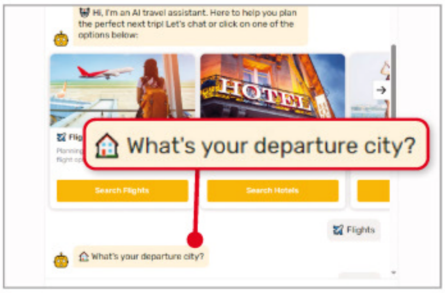
Trainline recently updated its iOS app (**tinyurl.com/APC551trainline**) with an AI assistant that answers questions about your ticket. You can ask if your train is on time, which platform it departs from and if your ticket has any restrictions.

The Trainline Assistant can even issue refunds for eligible tickets, following a simple request such as 'Can I get a refund?'. You'll find the tool in the My Tickets section of the iOS app, directly under your tickets for upcoming travel. Currently this is for European travel only, so is great for travellers. We hope it comes to Australia soon.

12 Find cheap flights and hotels

There are lots of AI tools for finding the best deals on flights in a conversational manner, rather than clicking boxes and calendars. We like Eddy Travels (**www.eddytravels.com**), a 'travel robot' you can chat to in your browser (see screenshot below) and WhatsApp.

Tell Eddy where and when you want to fly, the number of passengers and your budget, and it will suggest suitable flight deals, which you can click to book on Skyscanner. It also finds hotel deals on Booking.com. We also like Hopper (**www.hopper.com**), a mobile app that uses AI to predict the cheapest times to book flights and hotels.



Hi, I'm an AI travel assistant. Here to help you plan the perfect next trip! Let's chat or click on one of the options below:

What's your departure city?

What's your departure city?

Eddy Travels finds the best deals on flights and hotels.

13 Plan the perfect holiday

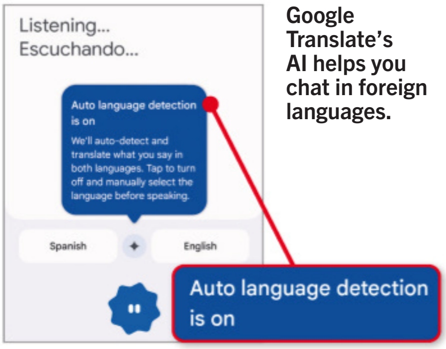
AI assistants are a great way to plan your holiday, recommending the best places to stay, eat and visit, and generating day-by-day itineraries. They can also help with booking accommodation, flights and car rental by providing links to relevant sites.

Mindtrip (**www.mindtrip.ai**) is a dedicated AI travel planner, which specialises in detailed itineraries that update automatically based on information you provide – including photos and links to online articles. It shows hotels, amenities and attractions on a map and recently launched an iOS app that serves as a travel companion during your trip.

14 Translate foreign languages in real time

ChatGPT has added live-speech translation to its Voice mode, but currently only for paid-for users (**tinyurl.com/APC551translate**). Gemini already offers this feature in the Live mode of its mobile apps, so you can chat fluently in foreign languages while abroad.

Press the Live button, tell Gemini the languages you want to translate to and from, and speak into your phone's microphone. Gemini will speak the translation aloud, translate the other person's response and save a text version of your chat. The option is also available in Google Translate's Conversation mode (**tinyurl.com/APC551gtranslate**), which detects languages automatically (see screenshot below).



Listening...
Escuchando...

Auto language detection is on

We'll auto-detect and translate what you say in both languages. Tap to turn off and manually select the language before speaking.

Auto language detection is on

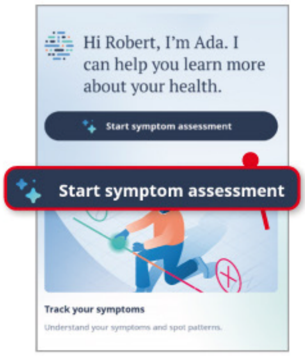
Google Translate's AI helps you chat in foreign languages.

IMPROVE YOUR HEALTH & FITNESS

15 Get advice about health worries

Although no AI tool is a substitute for a professional medical diagnosis, they can answer questions about your health worries. As well as asking ChatGPT and Gemini for general advice, you can use Ada Health for Android and iOS (**ada.com/app/**) to check your symptoms more precisely than many other checkers.

Tap 'Start symptom assessment' (see screenshot below) then answer the chatbot's questions about the nature, severity and duration of your symptoms.



Hi Robert, I'm Ada. I can help you learn more about your health.

Understand your symptoms and spot patterns.

Ada Health suggests possible causes for symptoms.

Ada will then generate a report suggesting possible causes, which you can share with your GP.

Alternatively, try Symptoma (**www.symptoma.com/**), which works in your browser.

16 Lose weight by eating more healthily

There are lots of apps that help you lose weight by using AI to monitor what you eat and generate healthy meal plans. Most have expensive monthly subscriptions, but Lifesum (**https://lifesum.com/**) is arguably the best freemium option.

Log your meals by describing their contents or scanning barcodes of food packaging, and Lifesum's AI will count the calories, carbs, protein and fat – as well as the calories you burn through exercise. It tracks your progress over time and suggests ways to eat more healthily.

17 Monitor your heart rate and breathing

Smart rings such as the Oura Ring (**ouraring.com**, pictured below) use AI to monitor your health by collecting and analysing biometric data. This includes your heart rate and variability, body temperature and breathing patterns during sleep.

Smart rings use AI to monitor your heart rate.

Oura gives you a Sleep Score and Readiness Score every morning, offering personalised insights into your health and daily guidance. Smart rings are lighter and more comfortable than smartwatches, though the best ones cost from $400.

18 Walk further and faster every day

Avoid expensive AI-powered fitness apps by using the free Google Fit (**www.google.com/fit/**) to count your steps and the energy you expend every day. The app uses sensors on your phone and AI algorithms to automatically detect and log activities including walking, running and cycling.

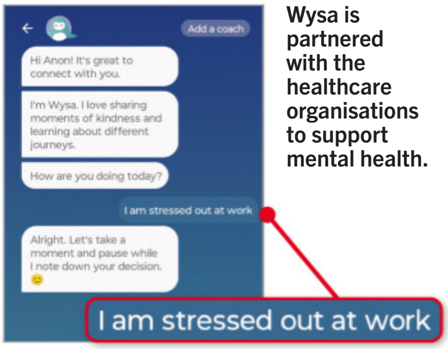
It awards you daily 'heart points' for moderate to intense physical activity, such as walking briskly (along with counting your 'move minutes') and sets you a target of 150 points per week.

On some phones, Google Fit can measure your heart and respiratory rates using AI and your device's camera – if available, you'll find these options at the bottom of the Home screen.

19 Get help with your mental health

AI can also assist with your mental health, though again it's no substitute for professional help. Wysa (**www.wysa.com/for-individuals**), which is partnered with healthcare organisations, uses AI to provide mental-health support.

Its penguin chatbot listens without judgement and offers advice on problems such as stress (see screenshot below), improving sleep and coping with difficult emotions. Wysa's responses are based on data from clinical experts, and all your conversations are kept confidential. It's free to use, but its library of self-care exercises costs $19.99 a month after a seven-day trial.



Hi Anon! It's great to connect with you.

I'm Wysa. I love sharing moments of kindness and learning about different journeys.

How are you doing today?

I am stressed out at work

Alright. Let's take a moment and pause while I note down your decision. 😐

I am stressed out at work

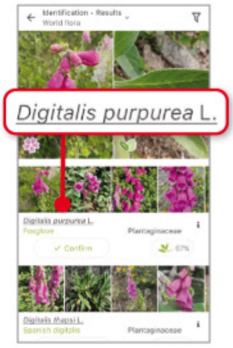
Wysa is partnered with the healthcare organisations to support mental health.

GET HELP WITH HOBBIES & INTERESTS

20 Identify plants and trees

ChatGPT and Gemini are good at identifying plants from photos, and searching the web for more information, but avid gardeners may prefer a specialist AI app. PlantNet (**https://plantnet.org/en/**) is our favourite because it's completely free (and ad-free), with no features restricted to a premium version.

It combines the latest AI technology with its vast community of users to identify over 20,000 species of plants (see screenshot below left) and trees from their leaves, flowers, fruit or bark. Its AI model is regularly retrained using new observations and community revisions.

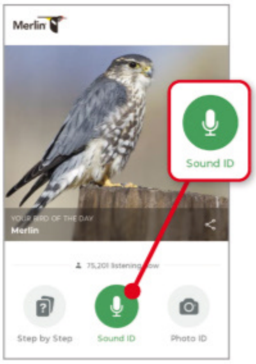


PlantNet identifies plant and tree species using AI

21 Identify birds from their songs

Merlin Bird ID (**https://merlin.allaboutbirds.org/**) is an essential free app for twitchers that makes ingenious use of AI. It identifies birds through recordings you share of their songs (see screenshot right), transforming the audio into visual representations called spectrograms. It can even distinguish multiple birds singing at once

The app also uses AI to identify birds from photos, covering more than 8,000 species and drawing on the massive eBird database of bird sightings.



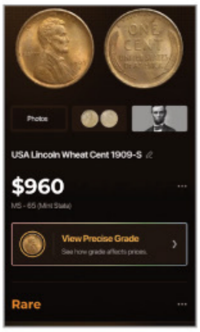
Merlin ID uses AI to identify birds from their songs.

22 Identify stamps from around the world

Stamp Identifier for Android (**tinyurl.com/APC551stamp**) and iOS (tinyurl.com/APC551stampio) uses AI-powered image recognition to identify any stamp from anywhere in the world. Using data from the Colnect Collectors Community, the app tells you the stamp's country of origin, issue date, print-run size and other useful information, and provides catalogue codes so you can check its current value.

23 Identify and catalogue coins

Numismatists (coin collectors) can use 'AI coin expert' CoinSnap (**https://coinidentifierai.com/**) to identify unfamiliar coins and discover their value. Upload a photo and CoinSnap's image-recognition will tell you where it comes from, its mintage and its approximate worth. You can then tap to add it to your collection (see screenshot right).



Use CoinSnap's AI to identify and catalogue coins.

CoinSnap also has an AI-powered grading feature, but this is only available with a Premium subscription, which costs US$5.99 a month. Decline the option to upgrade by tapping the 'x' in the top-right corner.

24 Get help with genealogy research

Genealogy websites such as Ancestry and FamilySearch use AI to digitise, transcribe and index old documents, allowing users to easily understand handwritten records. But AI assistants can also help you research your family history.

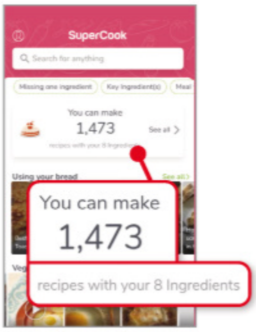
You can ask ChatGPT and Gemini for advice when you hit a dead end, such as the types of records you should be looking for and where; request historical details for a particular time and place; and even get them to generate a research plan. They can also summarise transcriptions of long documents such as wills, and explain archaic data in censuses.

The custom GPT model Ancestry Explorer (**www.snipca.com/55488**) is designed for this purpose and lets you upload GEDCOM files for analysis.

25 Find recipes

There are hundreds of AI-powered cooking apps, but most charge a monthly subscription. One of the best totally free options is SuperCook for Android (**tinyurl.com/APC551cook**) and iOS (**tinyurl.com/APC551cookio**).

Add a few ingredients based on what you have available, either by selecting or dictating them, and it will use AI to find matching recipes. If you're missing one ingredient, SuperCook adds it to your shopping list to buy later. You may not even need a cooking app because ChatGPT and Gemini generate easy-to-follow recipes, tailor them to your taste and needs. There are also custom GPTs for culinary ideas and advice, such as this one: **tinyurl.com/APC551culinary**.



SuperCook's AI finds recipes for available ingredients.

The home of technology

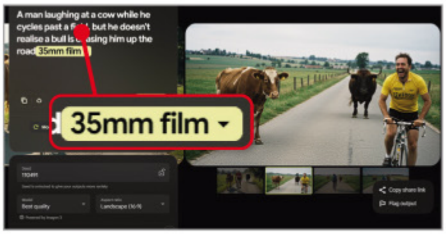
techradar.com

CREATE & ENHANCE PHOTOS & VIDEOS

26 Generate images for personal projects

The image-generation feature in AI chatbots offers a speedy free way to conjure up pictures for personal projects, such as custom greeting cards, posters, CD covers and websites. It saves you money on purchasing stock photos, and means you won't breach anyone's copyright by reusing pictures you find online.

We think Gemini's images are slightly better quality than ChatGPT's, plus there's no daily limit, but for the very best results try Google's ImageFX (**https://labs.google/fx/tools/image-fx**). This free online tool produces amazingly realistic pictures you can enhance using filters such as 35mm (see screenshot below) and download for free in high resolution.



A man laughing at a cow while he cycles past a fi , but he doesn't realise a bull is asing him up the road 35mm film

ImageFX creates photorealistic photos from text prompts.

27 Edit images using natural language

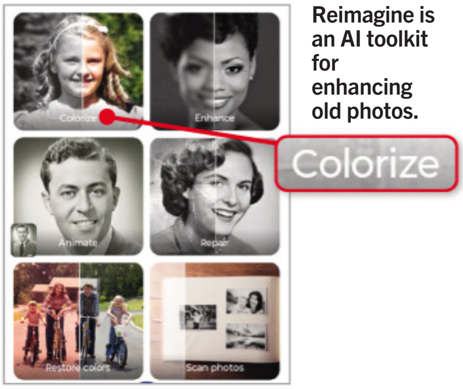
As well as generating images, ChatGPT can now edit existing pictures. This includes adding and removing elements, applying different styles and adjustments, and even changing facial expressions.

Using natural language to request these edits is much easier than fiddling around with layers and advanced options in image-editing software. Gemini also offers image editing but not yet to free users in Australia.

28 Fix problems with old photos

There are lots of AI tools for fixing old photos, but the most impressive we've seen is Reimagine from MyHeritage (**www.myheritage.com/reimagine/**). This lets you colourise (see screenshot above right), repair, enhance and animate photos, which you can scan directly in the app or upload from your collection.

The results are brilliant and you can try all the app's features for free before committing to a subscription ($12.99 a month or $59 a year). MyHeritage also offers separate versions of Reimagine's tools on its website (**www.myheritage.com/photo-enhancer**).



Reimagine is an AI toolkit for enhancing old photos.

29 Create short videos on any subject

OpenAI's video generator Sora (**https://openai.com/sora**) is now available in Australia, but only with a paid-for ChatGPT plan. You can try Sora for free by installing Microsoft's Bing Search app (**bingapp.microsoft.com/bing**).

This generates five-second videos from text prompts, which you can download in GIF format. Beyond that, you can create up to 10 clips for free using 'Fast mode' and an unlimited number in the slower Standard mode.

ENHANCE YOUR ENTERTAINMENT

30 Get personalised TV recommendations

All the main TV-streaming services use machine learning to recommend series and films to watch. These personalised suggestions are based on what you've searched for, viewed and 'liked', and what other users with similar tastes have watched.

We'll soon see more AI features on many services. Netflix is testing 'generative AI search', which lets you find shows and movies using conversational phrases (**tinyurl.com/APC551netflix**), and Prime Video is rolling out an AI Topics feature that suggests shows for your perceived interests (**tinyurl.com/APC551prime**).

31 Upscale your TV's picture and sound

Samsung's latest smart TVs include its new Vision AI technology (**www.samsung.com/us/tvs/vision-ai-tv/**), which upscales picture quality to near 8K-resolution on compatible sets. It adjusts brightness, contrast, colour and sharpness based on what's on screen and the lighting conditions in your living room, and also upscales the sound quality.

Samsung's latest TVs include a host of AI features.

Vision AI offers many other benefits, including live translation and pop-up information about what you're watching.

32 Create instant themed playlists

Spotify has a feature called AI Playlists (for Premium users only), which generates playlists based on text prompts. Tap 'Create' then AI Playlist and describe what you want to hear, such as 'songs about walking in the countryside'. Spotify will generate a playlist of relevant tracks, which you can refine using additional prompts before tapping Create.

It also has an AI DJ feature (again Premium only), which involves an AI host introducing selected songs, like a virtual radio show. To access this tap Search, then Made For You and choose DJ.

33 Compose your own music

ChatGPT and Gemini can't yet generate music, but there are lots of AI tools that can. Riffusion (**www.riffusion.com**) is particularly impressive, because it lets you create an unlimited number of good-quality songs for free (after creating an account) simply by entering a text prompt. These can be instrumental or use auto-generated lyrics.

If you want to write your own words, try Udio (**www.udio.com**). Although its free plan limits you to creating three songs per day, you can add your own lyrics and specify a 'vibe'.

MAKE TEDIOUS TASKS MUCH EASIER

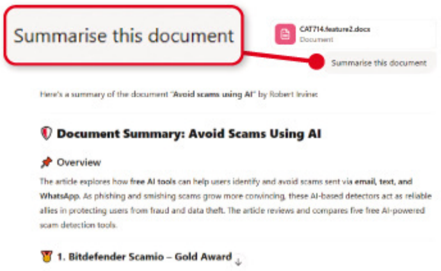
34 Write complaint letters to companies

AI assistants are ideal for writing complaint and dispute emails and letters to companies, in a formal tone you wouldn't normally use. Just tell them the nature of the complaint and the action you require, to generate an instant draft.

They're equally useful for friendlier correspondence, such as thank-you notes, recommendations and apologies. Ask the chatbot to adjust its tone as required.

35 Summarise complex documents

Save yourself the tedium of reading every word of a long, complex document, such as a contract, report or proposal, by asking ChatGPT or Gemini to summarise the key points for you. Upload the file, enter the prompt 'Summarise this document' (see screenshot below) and the chatbot will provide an overview and bullet-pointed breakdown of the contents. Double-check any details you're unsure about.



Summarise this document

Here's a summary of the document "**Avoid scams using AI**" by Robert Irvine:

Document Summary: Avoid Scams Using AI

Overview

The article explores how **free AI tools** can help users identify and avoid scams sent via **email, text, and WhatsApp**. As phishing and smishing scams grow more convincing, these AI-based detectors act as reliable allies in protecting users from fraud and data theft. The article reviews and compares five free AI-powered scam detection tools.

1. Bitdefender Scamio – Gold Award

Ask an AI assistant to summarise long documents for you.

36 Convert text into spreadsheets

ChatGPT is particularly good at extracting data from documents and placing it in another format, such as a table or spreadsheet – a task that typically takes ages and requires high levels of concentration when done manually. Simply upload a file, specify the format you want to convert it to and ChatGPT will do the rest.

Its spreadsheets automatically organise data into logical columns and rows, and it can even create formulas for Excel and Google Sheets.

37 Create your own calculator

Gemini's brilliant Canvas feature offers an easy way to create your own calculators, for everything from mortgages and savings to BMI and unit conversion. Simply ask Gemini to create an interactive calculator for your desired purpose, and it will generate the code in Canvas and present you with the result

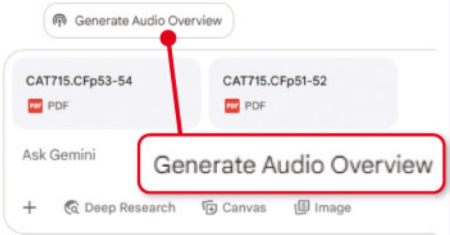
38 Transcribe conversations and meetings

Keep a record of online and real-world conversations and meetings by using Otter.ai (**https://otter.ai/**) to transcribe them for you. Its free plan lets you transcribe 300 minutes of voice calls, video calls and spoken chats per month (maximum of 30 minutes each), through the Otter.ai mobile apps and Chrome extension. The AI automatically detects individual speakers and summarises conversations.

39 Digest information from AI-generated podcasts

Gemini's Audio Overview feature creates podcast-style conversations from sources you provide, in which two human-sounding voices discuss the content. It's handy for digesting information in a natural manner while you get on with other things.

Upload documents and PDFs to the Gemini website or mobile app and it should offer to generate an Audio Overview (see screenshot below) – if not, type that prompt.



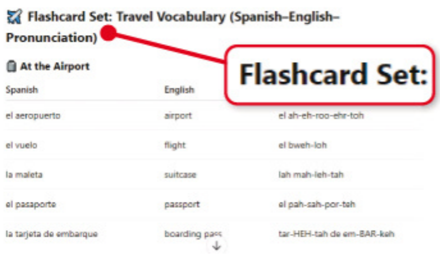
Audio Overview creates podcasts from your files and documents.

40 Practise job interviews

AI assistants can not only suggest the type of questions you might encounter at a job interview, but help you prepare by conducting a mock interview with you. Provide details of the role you're applying for, the type of interview and the areas you want to focus on, and the chatbot will ask appropriate questions and help you refine your answers.

41 Learn a new language

As well as translating foreign text and speech, chatbots can help you learn a new language or hone your existing skills. Specify which language you want to master and the AI assistant will help you build your vocabulary and learn common phrases through word lists, flashcards (see screenshot above) and quizzes. You can practise conversations in text chat or voice mode.



Flashcard Set: Travel Vocabulary (Spanish–English–Pronunciation)

At the Airport

Spanish	English	
el aeropuerto	airport	el ah-eh-roo-ehr-toh
el vuelo	flight	el bweh-loh
la maleta	suitcase	lah mah-leh-tah
el pasaporte	passport	el pah-sah-por-teh
la tarjeta de embarque	boarding pass	tar-HEH-tah de em-BAR-keh

AI assistants can help you master a foreign language.

42 Create a smart calendar

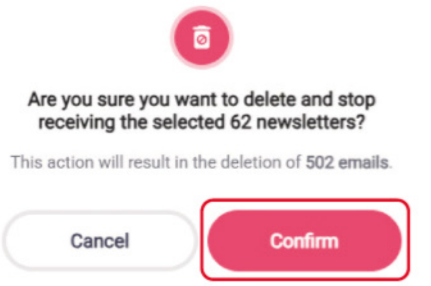
Reclaim.ai (**https://reclaim.ai/**) integrates with Google Calendar or Outlook Calendar, and uses AI to analyse your schedule and habits. It then helps you plan your life by choosing the best times and days for future events, so – for example – you don't commit to appointments when you're usually having lunch.

Owned by Dropbox, Reclaim.ai has a 'forever free' plan, which includes most of the smart calendar's features.

43 Clean up your email inbox

Cleanfox (**www.cleanfox.io/**) uses AI to clean up your email inbox. Available online and as a mobile app, it scans your inbox for newsletters and marketing emails, then deletes these junk messages and unsubscribes you from their mailing lists with a single click or tap (see screenshot below).

Cleanfox works with Gmail, Outlook, Yahoo Mail and most other email services. Unlike rival tools, it's completely free but collects data about what you buy online.



Are you sure you want to delete and stop receiving the selected 62 newsletters?

This action will result in the deletion of 502 emails.

Cleanfox uses AI to detect, delete and unsubscribe you from junk emails.

MANAGE YOUR HOME MORE EFFICIENTLY

44 Reduce your energy bills

Smart thermostats such as Nest, Ecobee and Tado devices use AI to create personalised schedules based on when you typically leave the house and return home, and your preferred temperature at different times of day. They also use sensors to detect motion, and analyse local weather forecasts to adjust their temperatures accordingly.

This automated control helps reduce your energy bills by ensuring you don't waste money on heating empty rooms, or overheating occupied ones. Google's fourth-generation Nest Learning Thermostat, which offers additional AI functions, is available for $552 (**tinyurl.com/APC551nest**) from importers, but isn't officially supported in Australia yet.

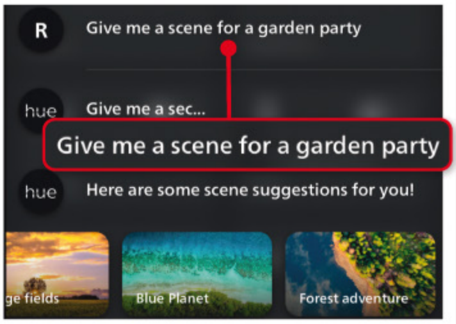
45 Set lighting moods

Smart-lighting systems use AI – in addition to voice commands – to control the lights in your home and garden. This includes applying adaptive brightness, learning your lighting routines, optimising energy usage and reacting to sensors.

The Philips Hue app for its smart lights has just been updated (**tinyurl.com/APC551hue**) with an AI assistant that lets you describe the type of lighting effect you want to see or mood you want to set (see screenshot below). The app will suggest something from its gallery of presets, or create something new to match your text or voice prompt.

46 Clean your house robotically

Basic robot vacuum cleaners use sensors to navigate your floors and change direction when they bump into objects, but more advanced models offer more thorough cleaning through AI. They create detailed maps of your home to plan the most efficient cleaning routes – room by room – and avoid obstacles automatically. Some models, such as the iRobot Roomba j7 (pictured below), use image-recognition to identify objects including cables, shoes, socks and even pet waste.



R Give me a scene for a garden party

hue Give me a sec...

Give me a scene for a garden party

hue Here are some scene suggestions for you!

The Philips Hue app lets you describe the mood you want to create with your lighting.

The iRobot Roomba j7 uses AI to detect objects.

47 Improve your home security

As we explained in our 'Who's at your door?' feature in *APC* issue 549, smart doorbells and home-security cameras make extensive use of AI. This includes detecting people, vehicles and animals, and differentiating between known individuals and intruders, so they can alert you to suspicious activity.

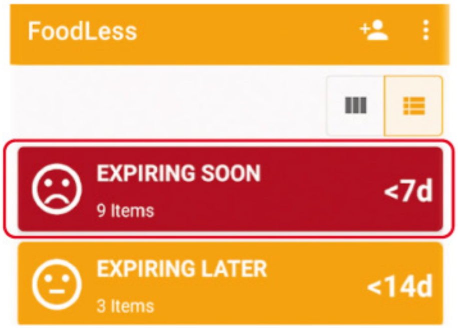
Ring and Eufy video doorbells use AI to notify you when a package is delivered or taken, while some security cameras – including TP-Link Tapo devices – recognise abnormal sounds such as glass breaking and dogs barking.

48 Ask for help with home repairs

ChatGPT and Gemini are invaluable sources of advice for home improvements and repairs. Ask about anything from putting up shelves to fixing a washing machine, and they'll provide step-by-step instructions, details of the parts and tools you need, and advice about when you should consult a professional. There's even a custom GPT called Expert DIY Assistant (**tinyurl.com/APC551diy**) that provides comprehensive guides to improving your home.

49 Identify mystery objects

If you're baffled by a mysterious object you've found in a drawer or cupboard, or are unsure which screw to use for a DIY project, upload a photo to ChatGPT or Gemini – or scan it with Google Lens. They'll identify it in seconds and look up more information online.



FoodLess

EXPIRING SOON
9 Items
<7d

EXPIRING LATER
3 Items
<14d

FoodLess uses AI to track food expiry dates.

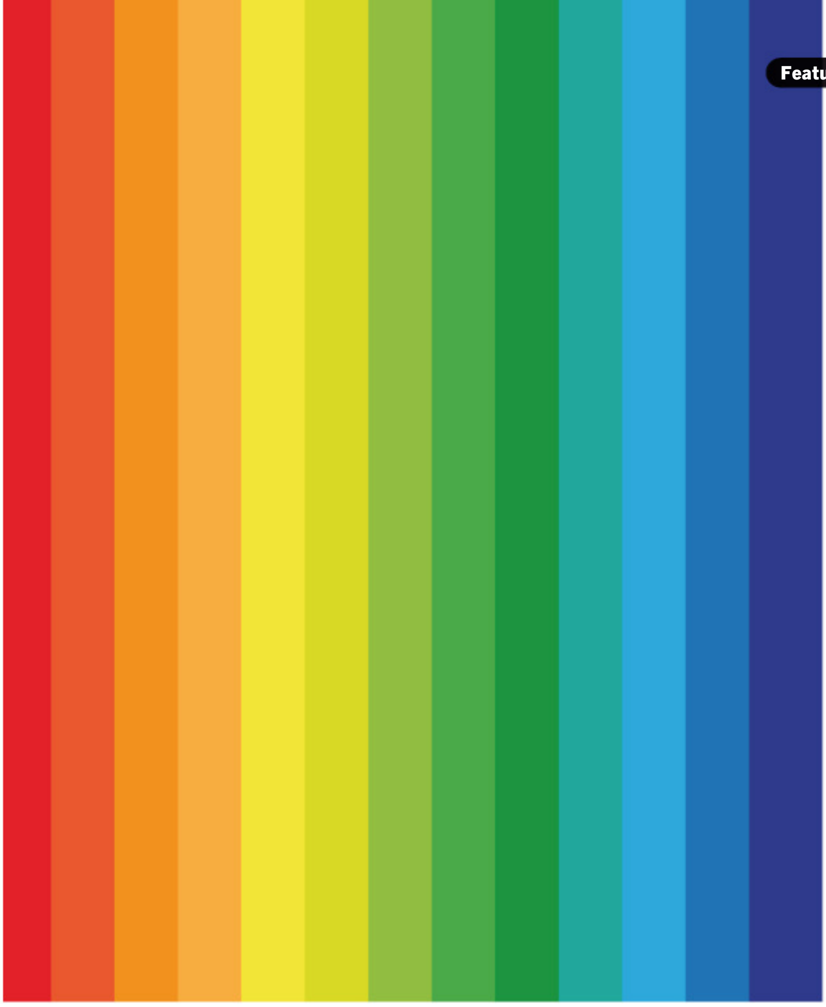
50 Reduce food waste

Samsung's high-end smart fridges have a feature called AI Vision Inside, which analyses fresh items you put in and take out, and notifies you when they're about to go off. This helps prevent food waste, but the fridges also cost thousands of pounds.

A cheaper if less sophisticated option is the free Android app FoodLess (**tinyurl.com/APC551food**), which scans the barcodes and use-by dates of food you put in your fridge or cupboard, then keeps track of when they're about to expire (see screenshot above). It sources information from the Open Food Facts database (**https://world.openfoodfacts.org/**). ■

Mac
If you can dream it,
Mac can do it.

Image credit: Apple Inc



SUPERCHARGE YOUR MAC

Unlock your Mac's full potential and take your experience to new heights with the best gadgets and devices.

Written by David Crookes

Your Mac is already an amazing computer – fast, efficient, well-built and part of an ecosystem that allows it to seamlessly work with your other Apple devices. But that doesn't mean your iMac, Mac mini, MacBook Pro, MacBook Air, Mac Studio or Mac Pro can't be improved. With the right accessories, you can create a personalised powerhouse, boosting productivity, unleashing your creativity and elevating your gaming experience.

In this superguide, we're exploring accessories that will take your Mac to another level. Whether you're a student managing coursework, a home user juggling everyday tasks, a music creator composing your next hit, a filmmaker editing your latest project, a keen photographer perfecting your shots, or a passionate gamer looking for a competitive edge, you'll find there's something here for you.

To that end, we're looking at drives and docks, input devices, displays, and other tech to help your Mac work flawlessly for any task. At the same time, we've kept budgets in mind: cost-conscious students won't want to break the bank but pros may choose to invest in top-tier gear.

So let's dive into what's on the market and discover how a well-chosen range of gadgets and devices can help to transform your Mac experience. Pair these products with quality software and you'll have a setup that is powerful, efficient and even more enjoyable to use.

› Image credit: Apple Inc

Home & Student

Work hard, play hard and enjoy your Mac to the max with this essential selection of great gadgets…

1

PlayStation 5 DualSense

$99.95

FROM playstation.com

FEATURES Built in battery and USB-C port, control pad and action buttons

Although designed for use with the PlayStation 5 console, the robust and comfortable DualSense wireless gamepad is also compatible with the Mac (as well as iPad and iPhone). You can't make use of haptic feedback nor the built-in mic and speakers, but the adaptive triggers are supported by some games. The thumb sticks and well-placed buttons are a joy to use.

2

MSI Modern MD342CQPW

$590

FROM msi.com

FEATURES 3440x1440 resolution, 34-inch ultra-wide screen, 1500R panel, 120Hz/4ms refresh/response

Curved monitors are great for playing games and watching videos. They also reduce eye strain and keep you more focused – perfect if you're working on an essay or just generally looking to enhance productivity. This great value height-adjustable ultra-wide monitor from MSI has a 120Hz refresh rate, one DisplayPort and two HDMI 2.0 ports, and great sound.

3

Logitech MX Brio

$249

FROM logitech.com

FEATURES Up to 4K resolution, up to 60fps, advanced autofocus, noise reducing microphone

A quality webcam is well worth the investment, whether you're connecting to video-based meetings for work or study, or simply looking to chat to family and friends. The Logitech MX Brio offers a choice of either 1080p or 4K resolution and the mic is powerful enough to pick up your voice from up to 1.2 metres away. It performs outstandingly well in low light.

› Image credits: Sony Interactive Entertainment Inc, Micro-Star Intl Co Ltd, Logitech

Whether you're working or studying, streaming your favourite shows, gaming into the night, or looking to get the best out of your Mac, there are plenty of powerful accessories to help you stay organised, work more efficiently, and enjoy all your Mac has to offer.

Here, you'll find a curated collection of great-value accessories that any typical Mac user is likely to need, from a versatile monitor for multitasking and creative work to a gamepad that takes your play to the next level.

We've included reliable options for capturing video and audio, printing high-quality documents with ease, and making your Mac more comfortable to use. Add a great mouse like the Logitech MX Master 3S, sleek earbuds such as the AirPods Pro 2, and smart cable management tools, and you'll have an efficient, enjoyable Mac setup for work and play in no time.

4

Plaud AI NotePin

$269

FROM au.plaud.ai

FEATURES 20 hours of continuous recording, 45 days standby, 64GB storage

Capable of recording audio with a single press, the NotePin can capture lectures or important conversations and transcribe them using artificial intelligence (AI). Available as a small device that's locatable using Find My, it can be worn as a pin, necklace or around the wrist, offering 20 hours of recording on a single charge, with files available to manage on your Mac.

5

Canon PIXMA TS6550i

$TBC

FROM canon.com

FEATURES 14 ipm mono / 9 ipm colour, Wi-Fi, two-sided printing, borderless photos

Canon's new attractive, affordable, wireless all-in-one printer is aimed squarely at home users and it is super-compact at just 374mm wide. Designed for easy printing via a smartphone, it'll just as effortlessly print via AirPrint from a Mac, delivering sharp text, clear detail and bright, borderless prints with speeds of up to nine images per minute in colour.

6

Twelve South Curve Flex

$139

FROM twelvesouth.com.au

FEATURES Elevation of up to 22 inches, angles up to 45 degrees, folds flat

Working on a MacBook for long periods of time can wreak havoc on your back. It's better to place it on a flexible notebook stand such as this one so that you can bring the screen and its camera up to eye-level, or ensure it's angled for more comfortable typing. Although you can use it at home, it's easy to fold away and light enough to take on your travels too.

› Image credits: Plaud.ai, Canon, Twelve South LLC

Photo & Video

Polish your photo and video projects with accessories that will sharpen your shots and footage.

OWC
THUNDERBOLT 5 HUB
USB 3.2 10Gb/s
2
3
OpticFilm 135i Ai
1

1

Samson Q9U

$259

FROM samsontech.com

FEATURES XLR output, wide dynamic range, 24-bit/96kHz high-definition digital audio resolution, attachable on stand

If you're producing podcasts or looking to create quality video voiceovers, consider a broadcast dynamic microphone. The Samson Q9U will help you to sound like a pro, capturing the depth of your voice while proving less sensitive to background noise. It connects via USB-C and allows for recordings direct to your Mac. Plug in headphones and listen in real-time.

2

OWC Thunderbolt 5 Hub

$399

FROM owc.com

FEATURES Three Thunderbolt 5 and one USB-A port, DisplayPort 2.1 support

Adding more Thunderbolt 5 ports to your Mac setup is particularly useful if you're a video editor and want to connect more monitors. With this quiet, fanless hub, which also supports DisplayPort 2.1, you can hook up to three 8K screens to your Mac – but you can also connect storage devices and other accessories if you wish, including those designed for Thunderbolt 3 and 4.

3

OpticFilm 135i AI

$1,448

FROM plustek.com

FEATURES Five-element lens, 35mm film support, up to 7200 dpi, batch scanning

Plustek's scanner lets you digitise film slides and negatives with ease. It can take a while – 25 minutes if you want to scan at a max of 7200 dpi – but it's versatile, supporting multiple film types including panoramic and allowing batch scanning. The lens has been designed to reduce refraction and the scanner comes with the pro-standard SilverFast AI Studio software.

› Image credits: Samson Distribution LLC, Other World Computing, Inc, Plustek

Looking for a Mac to power through photo and video editing? You needn't search far. A MacBook Pro will handle the best creative apps on the go, while an iMac or Mac mini will breeze through projects at your desk – more so if equipped with Apple's latest M4 silicon chips.

But investing in high-quality accessories can elevate your results further and make the creative process more enjoyable, so here we've selected gear that any photo or video enthusiast (hobbyist or semi-pro) will appreciate.

We've included a hub for connecting multiple monitors, a microphone for studio-quality voice recordings, a rugged Thunderbolt/USB-C SSD, and solid over-ear headphones. But maybe also consider a photo printer, desktop monitor speakers, or a colour-accurate 4K or 5K display such as the Apple Studio Display, to fully complete your creative setup.

4

SanDisk Extreme Pro

$499

FROM sandisk.com

FEATURES Supports Thunderbolt 4, USB 3.2 and USB 2.0 devices, 3800MB/s read speeds, 3700MB/s write speeds

With support for Thunderbolt 4, this revamped version of the SanDisk Extreme Pro SSD drive is a dream for anyone storing lots of images and videos. Aside from offering 2TB of space, it has lightning-fast transfer speeds. You can also take the drive with you and rest assured that it'll survive drops of up to two metres and some of the milder elements of Mother Nature.

5

Go Pro HERO13 Black Ultra Wide Edition

$865

FROM gopro.com

FEATURES 177° field of view, HyperSmooth stabilisation, scratch-resistant hydrophobic lens

Want to capture thrilling shots and put viewers in the thick of the action? You need a point-of-view camera. GoPro's new model is 36% wider than its standard HERO13 Black and that lets you capture video with a 177° field of view in 4K at 60fps. Viewing and trimming can be done on an iPhone as well as in the HyperSmooth Pro player on Mac.

6

Sony MDR-M1

$499

FROM sony.com.au

FEATURES High sound isolation, well-balanced frequency response range between 5Hz and 80kHz

Designed for music creators and sound engineers in collaboration with industry experts, these over-ear, closed back headphones are also a good buy if you're editing audio for videos. Not only are they comfortable to wear for long sessions, they pump out well-balanced, ultra-wideband, studio-quality sound that is free of ambient noise and sound leakage.

› Image credits: Sandisk Corporation, GoPro Inc, Sony Europe B.V.

Creative Pro

Unlock your creative potential with a selection of must-have accessories that will bring your ideas to life.

logi
1
Pr
LrC
Ae
Ps
Au
Ai
logi
2
3

1

Logitech MX Creative Console

$279

FROM logitech.com.au

FEATURES Creative Dialpad for tactile control and Creative Keypad with LCD display keys

The Logitech MX Creative Console is a fresh way to interact with creative apps, whether that's Adobe Photoshop, Lightroom and Premiere Pro or After Effects, Final Cut Pro, Affinity Photo and more. Customise a set of keys, ensuring core functions are only a press away, and use the dialpad to make precise adjustments to your workflow.

2

Wacom Intuos Pro 2025

From $396

FROM wacom.com

FEATURES 16:9 format, pairs via Bluetooth or USB, uses the innovative Pro Pen 3

Wacom's flagship tablet has been updated and it's become near essential for digital artists and graphic designers. Running wirelessly for up to 16 hours, it can connect to a Mac, letting you flex your creative muscles using the Pro Pen 3. This pen has 8,192 pressure levels, doesn't need charging and comes with interchangeable grips and programmable shortcut buttons.

3

Arturia Keylab 88 mk3

$1,695

FROM arturia.com

FEATURES 88 keys, MIDI controller, Fatar TP/110 hammer-action keypad with aftertouch

It's not cheap and neither is it sleek but this heavy 88-key hammer action MIDI controller keyboard is a great way to make music. Integrating with any digital audio workstation including Logic Pro on your Mac, it offers a dynamic playing experience with advanced connectivity. It also has a colour 3.5-inch screen with eight contextual buttons for greater control.

› Image credits: Logitech, Wacom, Arturia

Creative professionals will benefit from investing in devices that provide even more control over their workflow. There are many peripherals designed for digital artists, designers, musicians and pros working with photos and video, aimed at unlocking their full potential.

Some accessories are truly innovative, such as the MX Creative Console which lets you map buttons, knobs, and dials to the functions you use most. Others are simply useful: a colour calibrator such as the Spyder Pro ensures your displays show consistent, true-to-life colours.

We've included a versatile MIDI controller, a graphics tablet and a trackpad for more natural input, as well as keyboard covers so commands and shortcuts are easier to find. You may also want to add a fast SSD or hard drive, a large-format printer such as the HP DesignJet T250, and a pro scanner.

5
6
4
datacolor
SpyderPro

4

Datacolor Spyder Pro colour calibrator

$575

FROM datacolor.com

FEATURES Unlimited brightness settings, adjusts for ambient room light, calibrates eight backlight types

If you need what's on screen to look the same in print, then you must ensure your display is calibrated. The Spyder Pro only needs to be placed on the screen and it will get to work, enabling you to adjust and optimise the richness and accuracy of the colours. It'll work with displays including OLED, miniLED and Apple Liquid Retina XDR.

5

Apple Magic Trackpad

$179

FROM apple.com/au

FEATURES Force Touch, Multi-Touch, Bluetooth, USB-C port, wireless

Thanks to the large size of the Magic Trackpad and its ability to recognise multi-touch gestures and Force Touch, this accessory offers precision and control over your creative endeavours. Automatically pairing with your Mac, the trackpad instantly makes it easier to swipe, scroll, zoom and pan, making it great for photo editing and 3D modelling. It also works with iPad and Apple Vision Pro.

6

Keyboard covers

From $22

FROM editorskeys.com

FEATURES Shows keyboard shortcuts, protects against spills, fully washable

Are you making extensive use of Final Cut Pro, Photoshop, GarageBand, iMovie, Xcode or one of a host of other macOS apps? Well, these colourful covers can be placed over your MacBook Pro and iMac keyboards to show the various shortcuts you can use to speed up your tasks. They peel off as easily as they're fixed in place and they can be swapped, reused and even washed when needed.

› Image credits: Datacolor, Apple Inc, Editors Keys

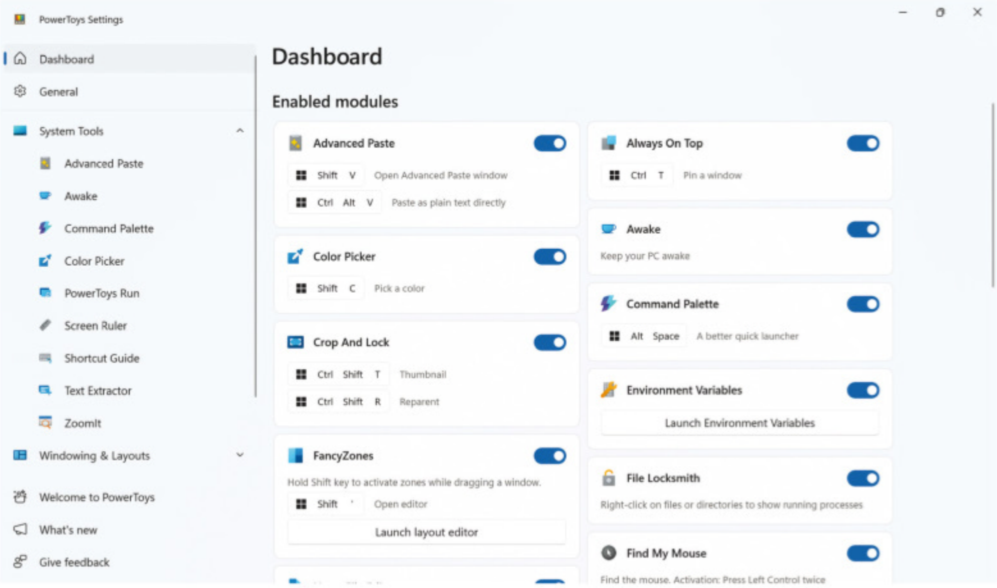
8 POWERTOYS YOU'LL USE EVERY DAY

MICROSOFT'S FREE UTILITIES FOR WINDOWS ADD ALL SORTS OF NEAT AND USEFUL FEATURES: NIK RAWLINSON PICKS OUT THE BEST.

The Windows PowerToys date all the way back to the days of Windows 95. Those who were lucky enough to have internet access in those days could download a set of 15 little utilities that enabled them to tweak the Windows interface, customise their context menus, enhance CD-ROM features and personalise the operating system in various other ways.

Since then, the PowerToys suite has been through several iterations, with features appearing and disappearing over time; with Windows 10 it was relaunched as a set of open-source tools, distributed via GitHub and the Microsoft Store. It's also evolved from a collection of standalone utilities into a single download with a unified front end, from which you can easily activate, deactivate and manage all the various components.

You can install the suite from the Microsoft Store by searching for "Microsoft PowerToys". Once it's installed, launch "PowerToys (Preview)" from the Start menu to open the main PowerToys app. Don't worry about the "Preview" part – that's been there for many years. At this point it's little more than a jokey reference to the fact that the PowerToys are continually being developed.


PowerToys Settings
Dashboard
General
System Tools
Advanced Paste
Awake
Command Palette
Color Picker
PowerToys Run
Screen Ruler
Shortcut Guide
Text Extractor
ZoomIt
Windowing & Layouts
Welcome to PowerToys
What's new
Give feedback
Dashboard
Enabled modules
Advanced Paste
Shift V Open Advanced Paste window
Ctrl Alt V Paste as plain text directly
Color Picker
Shift C Pick a color
Crop And Lock
Ctrl Shift T Thumbnail
Ctrl Shift R Reparent
FancyZones
Hold Shift key to activate zones while dragging a window.
Shift ` Open editor
Launch layout editor
Always On Top
Ctrl T Pin a window
Awake
Keep your PC awake
Command Palette
Alt Space A better quick launcher
Environment Variables
Launch Environment Variables
File Locksmith
Right-click on files or directories to show running processes
Find My Mouse
Find the mouse. Activation: Press Left Control twice

ABOVE **The main dashboard shows you each module and tells you briefly what each one does.**

The main PowerToys dashboard gives you an overview of enabled modules, along with a quick reminder of what each one does and a handy switch for turning individual features on and off. You can browse more deeply using the navigation list on the left, which divides the available features into various categories such as "System Tools", "Windowing & Layouts" and so forth. You can also bring up a quick-access mini-dashboard at any time by clicking the PowerToys icon in the System Tray; click the "More" button here to bring up the full dashboard.

There are currently 27 PowerToys to explore, with new ones appearing from time to time. Some have a narrow focus, such as the Hosts File Editor, whose sole function is updating the "hosts" file that's used for manually resolving IP addresses; others can help you handle a whole range of daily tasks more quickly and effectively. Here's our pick of the top eight PowerToys that almost everyone should find useful.

1 POWERTOYS RUN

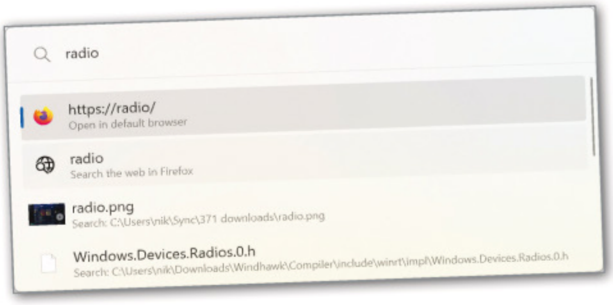
PowerToys Run is an alternative app launcher to the Windows Start menu, which looks and works similarly to the Spotlight feature on macOS. You'll find it in the PowerToys app under System Tools. Once it's active, you can simply press Alt and Space together to bring up the Run window in the middle of your screen, then start typing the name of whatever program you want to run. PowerToys Run instantly starts showing results below the main Run window; key down to select one, or keep typing and just hit Return when the option you want is highlighted at the top of the list.

In fact, PowerToys Run is much more than merely an app launcher. As well as running programs, you can use it to search your files, run shell commands, visit web pages, perform maths operations and more. You'd be surprised how much more smoothly your work will flow when all of these tasks are rolled into a single dialog box – and best of all, you don't need to reach for the mouse every time you use it.

2 PEEK

Peek emulates another long-standing feature found on the Mac – namely Quick Look. This handy feature lets you select any file in the macOS Finder, then hit Space to pop up an instant preview of images, PDFs, text documents and more.

Peek works in exactly the same way – the biggest difference is the keypress, as it requires you to hit Ctrl+Space to see the contents of whatever file is currently selected in the Windows File Explorer. Peek works with a huge range of file types, including text, images, Office documents, ebook files and even audio and video media. You can also use the cursor keys to step through a list of files while keeping the preview window open, so – for example – you can easily browse through a whole folder full of documents to find the one you want.



radio

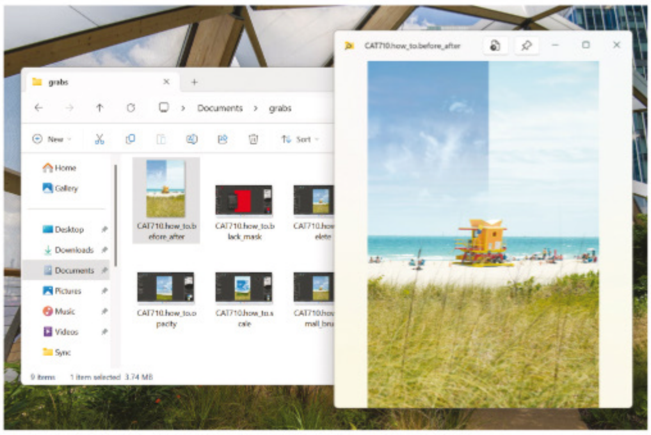
https://radio/
Open in default browser

radio
Search the web in Firefox

radio.png
Search: C:\Users\nik\Sync\371 downloads\radio.png

Windows.Devices.Radios.0.h
Search: C:\Users\nik\Downloads\Windhawk\Compiler\include\winrt\impl\Windows.Devices.Radios.0.h

LEFT PowerToys Run gives you quick access to apps, files and information.



ABOVE Rather than opening files, you can use Peek to preview their contents quickly.

3 TEXT EXTRACTOR

There are plenty of OCR tools out there, but their workflows can be fiddly (and they're certainly not all free). PowerToys Text Extractor provides an easy way to grab the text from any image visible on your screen.

Before using it, make sure that the image text you want to copy is visible and unobscured. Now press Windows+Shift+T to activate Text Extractor. You'll see an overlay appear on your screen; you can optionally select a language from here, in order to help Text Extractor recognise the text as accurately as possible, and choose whether you want text to be formatted as a single line or as a table.

Then just click and drag over text you want to capture. The text will be automatically recognised and copied to the clipboard, from which you can paste it wherever required.

4 IMAGE RESIZER

You can resize images in Microsoft Paint – or almost any graphic-editing package – but if you just want to shrink an image down for uploading to the web or attaching to an email, that's overkill. And if you want to resize a whole folder full of images at once, it's downright tedious to have to load, resize and save each one in turn.

The Image Resizer PowerToy lets you resize images directly from the File Explorer context menu. To use it, select one or more image files, then right-click and select "Resize with Image Resizer" from the context menu.

In the dialog that opens, select a preset size from the dropdown menu, or enter custom dimensions as required. You'll notice that there's also an option to reduce pictures that are larger than the specified dimensions, while not touching ones that are smaller. This is particularly handy if you want to shrink a set of differently sized images, without compromising the quality of smaller ones by blowing them up.

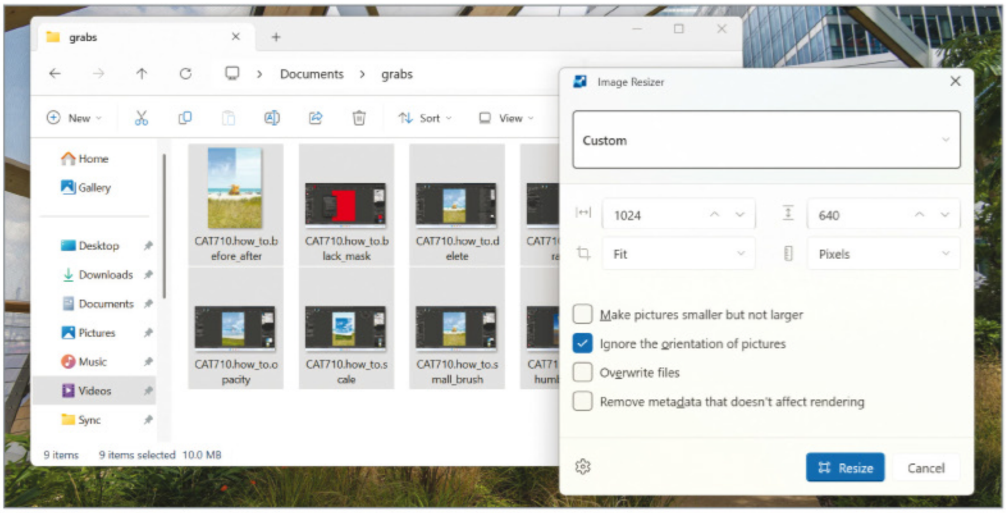
5 QUICK ACCENT

If you regularly work with foreign names or terms, getting the accents right is important. Windows lacks a simple, native way of typing accented characters, but Quick Accent adds one.

This is great if you're typing in multiple languages or using a borrowed word with an accent, giving you access to characters that your keyboard doesn't have a key for. Once you've enabled Quick Accent, you can activate it by holding down the key for any character to which you want to add an accent, and tapping the left or right cursor or the space bar. For example, if you want to type "*sac à dos*", you might press and hold the "a" when you get to it, then quickly tap the left cursor. This will bring up the Quick Accent selector at the top of the screen, showing a variety of accented variants of the letter. Use the cursor keys to navigate to the one you want, then release the "a" key to add your chosen character to your document.

If you don't see the characters you're looking for, go into the main Quick Accent settings in the main PowerToys app (you'll find it under "Input / Output") and select which of the 37 supported languages you're trying to use.

If you find that Quick Accent interferes with programs that use a long key press for some other function, you can also disable it in specific applications. Click on the Excluded apps to do so, then type in the name of the application you want to exclude. Note that partial matches will also be excluded, so if you type "notepad" then Quick Accent will be disabled in both the standard Windows application plus the third-party Notepad++ app, if you have it installed.



Custom
1024 × 640
Fit
Pixels
☐ Make pictures smaller but not larger
☑ Ignore the orientation of pictures
☐ Overwrite files
☐ Remove metadata that doesn't affect rendering

ABOVE **Image Resizer adds a resizing tool to the File Explorer menu.**

BELOW LEFT **Quick Accent makes adding accented characters easy.**

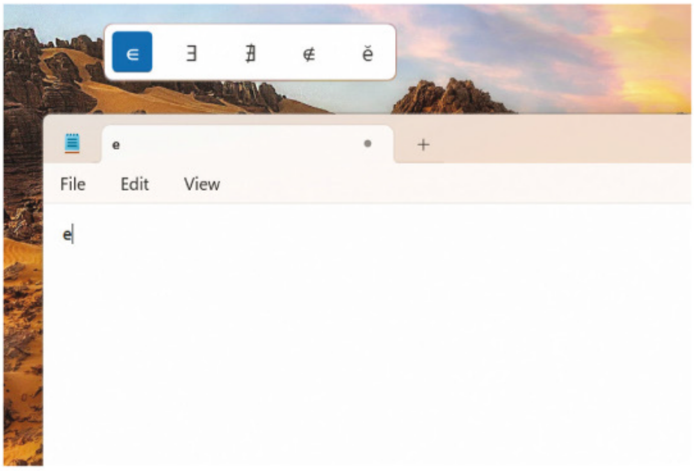
BELOW RIGHT **In Keyboard Manager you can remap single keys or combination shortcuts.**

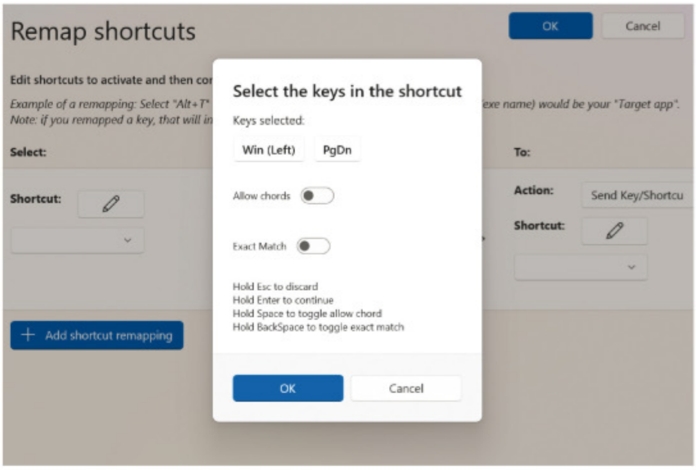
6 KEYBOARD MANAGER

Quick Accent is fine as far as it goes, but sometimes you might want an easy way to enter other characters, such as a copyright symbol. Keyboard Manager lets you assign these characters to keys on your keyboard, or to key combinations using the Alt, Control, Shift or Windows keys. You can also create string shortcuts, so that pressing a key combination inserts a whole predefined passage of text.

To remap a single key on your keyboard, go to Keyboard Manager's settings page (also located under "Input / Output"), then click "Remap a key". In the dialog that opens, click "+ Add key remapping", then click Select in the first column and either press the key you want to remap or select a key from the dropdown menu beneath it. Now, using the dropdown menu in the "To send:" column, choose whether you want this key to trigger a different key or shortcut, or to insert text.

You can also remap existing shortcuts. In our case, our keyboard doesn't have a dedicated Print Screen button, so we'd like to assign that function to a different key combination. We can do this by



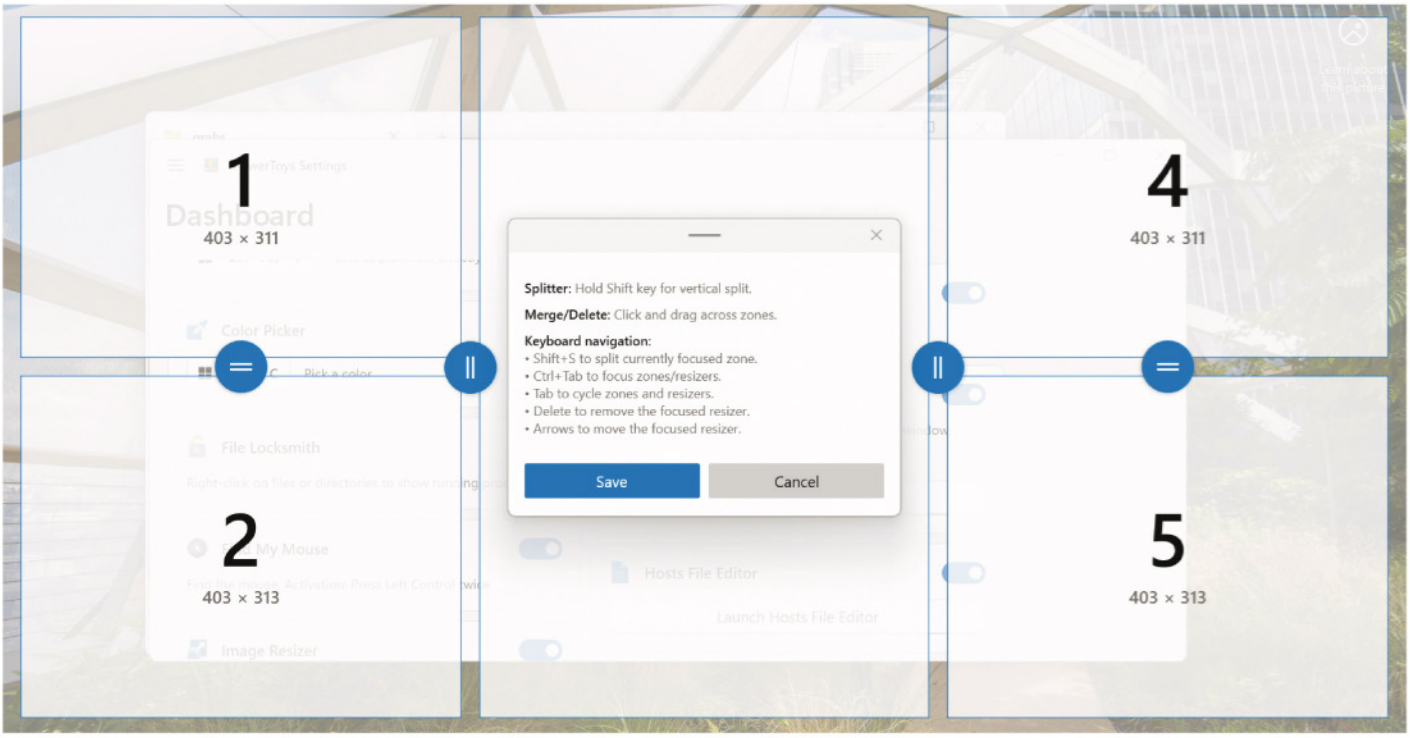


Remap shortcuts

Edit shortcuts to activate and then co
Example of a remapping: Select "Alt+T" … *exe name) would be your "Target app".*
Note: if you remapped a key, that will in

Select:
Shortcut:
To:
Action: Send Key/Shortcu
Shortcut:

Select the keys in the shortcut
Keys selected:
Win (Left) PgDn
Allow chords
Exact Match
Hold Esc to discard
Hold Enter to continue
Hold Space to toggle allow chord
Hold BackSpace to toggle exact match



Splitter: Hold Shift key for vertical split.

Merge/Delete: Click and drag across zones.

Keyboard navigation:
- Shift+S to split currently focused zone.
- Ctrl+Tab to focus zones/resizers.
- Tab to cycle zones and resizers.
- Delete to remove the focused resizer.
- Arrows to move the focused resizer.

ABOVE FancyZones lets you define your own boundaries for more flexible window layouts.

selecting "Remap a shortcut" in the Shortcuts section, followed by "+ Add shortcut remapping".

We now need to click the pencil icon and press the key combination we want to remap – in our case, we've chosen Windows+PgDn, because the PgDn key sits close to where you'd normally find a PrtSc button. After doing this, we click OK, and select "Print Screen" from the dropdown menu on the "To:" side of the window. You could also hit the pencil button again and press the key you want to invoke, but we can't do that in this case as the whole point is that we don't have that key on our keyboard.

To the right, you'll see an option for "Target app"; the default setting is "All apps", meaning this substitution will apply everywhere in the operating system, but if you want to confine the remapping to a single program, you can enter it here. You'll need to use the process name, rather than its friendly name – so Microsoft Word, for example, is winword.exe, Teams is ms-teams.exe and so on. You can check the names of running processes in the Task Manager.

You can remap almost all Windows shortcuts, but not Ctrl+Alt+Delete – nor Windows+L, which locks the screen. Microsoft also warns that if you try to reassign the Windows+G shortcut, it might still open the Xbox Game Bar. If this is a problem, disable Game Bar in the Windows Settings app, and turning off the switch beside "Allow your controller to open Game Bar".

7 MOUSE UTILITIES

As computer displays get bigger (and more numerous), it can be easy to lose track of your mouse pointer. Mouse Utilities helps you quickly locate the cursor whenever you need to, by shaking your mouse, pressing Ctrl twice in quick succession, or using a custom keyboard shortcut. The screen will momentarily go dark, leaving just a light patch around the pointer to highlight its position.

That's not all Mouse Utilities can do. If you've ever recorded your screen, you may have realised that a viewer can't tell when you're clicking the mouse button. Mouse Utilities can be set to display a coloured circle around the pointer when you click, making it easy for others to see what you're doing. It's a simple but valuable tool, whether you're putting together an instructional video or capturing some on-screen action for tech support.

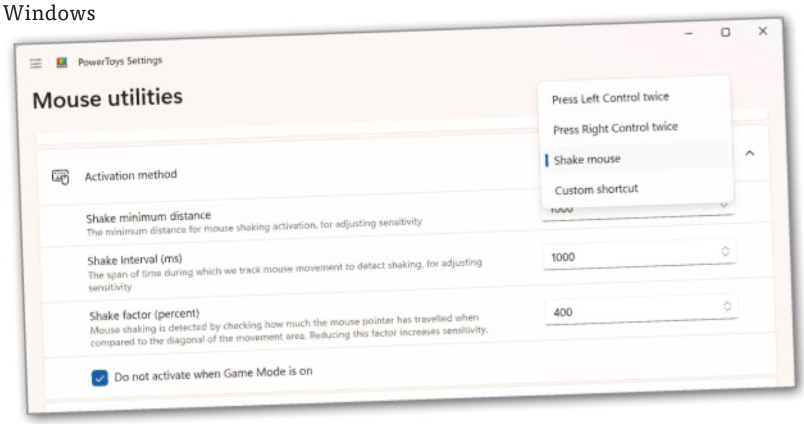
While Mouse Utilities is great for desktop productivity, the mouse-shake detection can sometimes trigger while you're playing a game. If that gets in your way, go into the Mouse Utilities settings in the main PowerToys app and you'll find an option to disable it when your computer is in game mode.

8 FANCYZONES

We're big fans of the window-snapping features in Windows 11, which help you organise active windows to ensure the best use of your display. If you find the preset locations limiting, however, FancyZones lets you define your own, and apply preset layouts so you can always have your applications appear where you want them at the start of the working day.

To use it, hold down the Windows key and the Shift button, then press the apostrophe key to open the FancyZones Editor. You can now select from one of the existing layouts, or create one from scratch by clicking "+ Create new layout". Give your custom layout a name, then choose between a Grid layout, in which windows nudge up against their neighbours without encroaching, or Canvas, where windows can overlap.

Click Create again, then use the drag handles to resize the suggested zones; you can also use the arrows to move a focused resizer around, or remove any you don't want. You'll notice that moving your mouse within an existing zone repositions a horizontal bar – this indicates where the zone will split if you click, to create panels above and below. ■



Shake minimum distance
The minimum distance for mouse shaking activation, for adjusting sensitivity

Shake Interval (ms) 1000
The span of time during which we track mouse movement to detect shaking, for adjusting sensitivity

Shake factor (percent) 400
Mouse shaking is detected by checking how much the mouse pointer has travelled when compared to the diagonal of the movement area. Reducing this factor increases sensitivity.

☑ Do not activate when Game Mode is on

BELOW Mouse Utilities makes it easy to locate your mouse pointer.

SECRETS OF HOME NETWORK ADMINISTRATION

DARIEN GRAHAM-SMITH EXPLORES THE TIPS AND TOOLS THAT CAN HELP YOU MANAGE YOUR PERSONAL LAN LIKE A PRO.

Administration isn't just for corporate IT departments. If you're responsible for the stability and security of any sort of computer network – even a few computers at home – you're an administrator, whether you like it or not. So why not borrow some ideas from the world of professional IT management?

Don't think of it as taking on extra work. Putting a little effort into administration lets you focus the rest of your time and energy on being productive, rather than being distracted by unplanned troubleshooting and housekeeping tasks.

Windows comes with a decent set of built-in, user-friendly management features, including account security, built-in virus protection and automatic updates. But there's plenty more that you can accomplish by digging beneath the surface, and by downloading a few judiciously chosen third-party additions. Here are some of our favourite tips and tools for keeping your network running smoothly and securely.

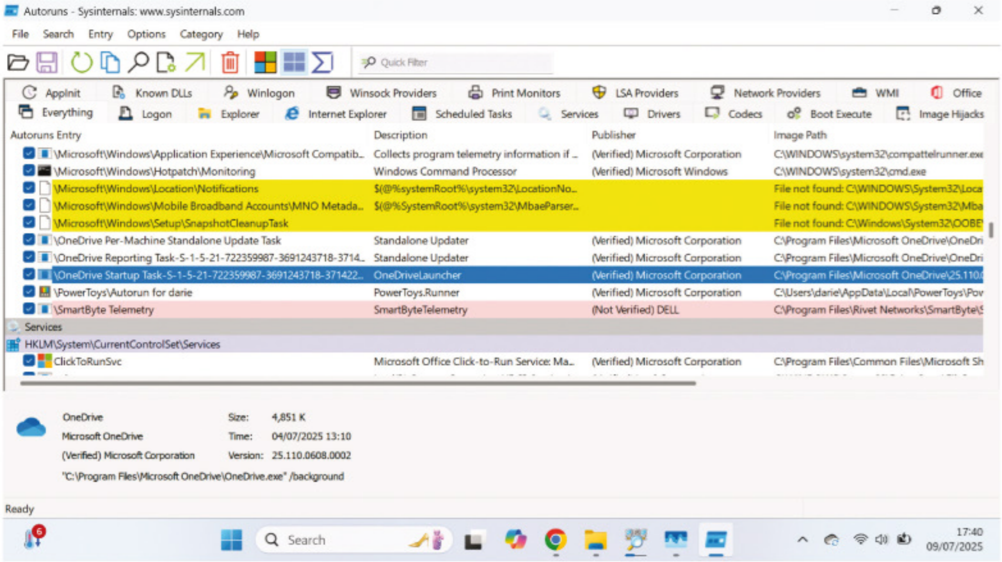
KEEP ONLINE DEVICES SECURE

There's an old saying, "if it ain't broke don't fix it" – and who wants to worry about network devices that seem to be working fine? Unfortunately, when you leave them untouched, the risk grows that they'll become susceptible to newly discovered vulnerabilities.

Things aren't as bad as they used to be. Almost all connected devices in a modern home should be capable of receiving online updates. There's usually even an auto-update option, so that's something you don't need to be continually chasing – but you do need to ensure it's turned on. Indeed, you should check the default settings of all your devices, paying particular attention to any optional privacy and security features.

You can further reduce your exposure to online threats by segmenting your network. Devices such as smart light bulbs, sockets and washing machines can be exploited just like regular computers – in fact, they're often more vulnerable, since the manufacturers don't invest so much time and money into their upkeep. But since they're generally controlled over the internet, they don't need to be able to talk directly to your personal laptop or NAS unit. Cutting them off – putting them on their own subnet with no access to your personal files or shared storage – ensures they can't be exploited as an infection vector for a botnet or ransomware attack on the devices you really do care about.

Some routers offer a dedicated IoT wireless network for just this purpose; others allow you to set up your own VLANs, if you're comfortable with this slightly technical process. Worst case, you can usually activate an isolated guest network and connect your less trusted devices to this rather than the main SSID.

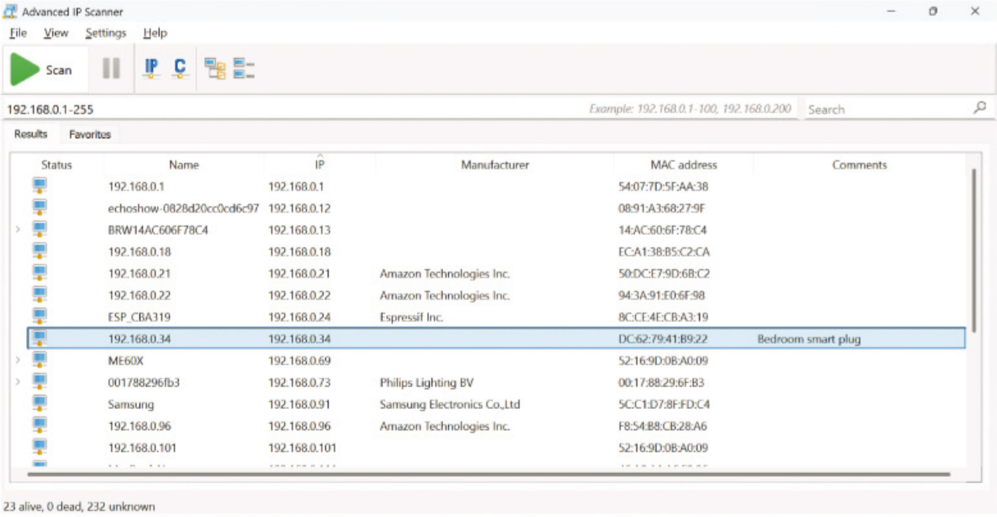


Autoruns Entry	Description	Publisher	Image Path
☑ \Microsoft\Windows\Application Experience\Microsoft Compatib...	Collects program telemetry information if ...	(Verified) Microsoft Corporation	C:\WINDOWS\system32\compattelrunner.exe
☑ \Microsoft\Windows\Hotpatch\Monitoring	Windows Command Processor	(Verified) Microsoft Windows	C:\WINDOWS\system32\cmd.exe
☑ \Microsoft\Windows\Location\Notifications	$(@%systemRoot%\system32\LocationNo...		File not found: C:\WINDOWS\System32\Loca
☑ \Microsoft\Windows\Mobile Broadband Accounts\MNO Metada...	$(@%SystemRoot%\system32\MbaeParser...		File not found: C:\WINDOWS\System32\Mba
☑ \Microsoft\Windows\Setup\SnapshotCleanupTask			File not found: C:\Windows\System32\OOBE
☑ \OneDrive Per-Machine Standalone Update Task	Standalone Updater	(Verified) Microsoft Corporation	C:\Program Files\Microsoft OneDrive\OneDri
☑ \OneDrive Reporting Task-S-1-5-21-722359987-3691243718-3714...	Standalone Updater	(Verified) Microsoft Corporation	C:\Program Files\Microsoft OneDrive\OneDri
☑ \OneDrive Startup Task-S-1-5-21-722359987-3691243718-371422...	OneDriveLauncher	(Verified) Microsoft Corporation	C:\Program Files\Microsoft OneDrive\25.110
☑ \PowerToys\Autorun for darie	PowerToys.Runner	(Verified) Microsoft Corporation	C:\Users\darie\AppData\Local\PowerToys\Pow
☑ \SmartByte Telemetry	SmartByteTelemetry	(Not Verified) DELL	C:\Program Files\Rivet Networks\SmartByte\S
Services			
HKLM\System\CurrentControlSet\Services			
☑ ClickToRunSvc	Microsoft Office Click-to-Run Service: Ma...	(Verified) Microsoft Corporation	C:\Program Files\Common Files\Microsoft Sh

OneDrive
Microsoft OneDrive
(Verified) Microsoft Corporation
"C:\Program Files\Microsoft OneDrive\OneDrive.exe" /background

Size: 4,851 K
Time: 04/07/2025 13:10
Version: 25.110.0608.0002

ABOVE You'd be amazed how many processes fire up when Windows boots.



192.168.0.1-255

Status	Name	IP	Manufacturer	MAC address	Comments
	192.168.0.1	192.168.0.1		54:07:7D:5F:AA:38	
	echoshow-0828d20cc0cd6c97	192.168.0.12		08:91:A3:68:27:9F	
	BRW14AC606F78C4	192.168.0.13		14:AC:60:6F:78:C4	
	192.168.0.18	192.168.0.18		EC:A1:38:B5:C2:CA	
	192.168.0.21	192.168.0.21	Amazon Technologies Inc.	50:DC:E7:9D:6B:C2	
	192.168.0.22	192.168.0.22	Amazon Technologies Inc.	94:3A:91:E0:6F:98	
	ESP_CBA319	192.168.0.24	Espressif Inc.	8C:CE:4E:CB:A3:19	
	192.168.0.34	192.168.0.34		DC:62:79:41:B9:22	Bedroom smart plug
	ME60X	192.168.0.69		52:16:9D:0B:A0:09	
	001788296fb3	192.168.0.73	Philips Lighting BV	00:17:88:29:6F:B3	
	Samsung	192.168.0.91	Samsung Electronics Co.,Ltd	5C:C1:D7:8F:FD:C4	
	192.168.0.96	192.168.0.96	Amazon Technologies Inc.	F8:54:B8:CB:28:A6	
	192.168.0.101	192.168.0.101		52:16:9D:0B:A0:09	

23 alive, 0 dead, 232 unknown

BELOW A simple network scanning tool can identify everything hiding on your network.

AUDIT YOUR NETWORK

To decide what's going to connect to which network, you'll find it helpful to have a complete list of all devices using your router. The router's own management interface can give you a rundown of all attached devices, but this isn't always very helpful; it might well be just a list of IP and MAC addresses, leaving you none the wiser as to what's actually connected.

A free tool called Advanced IP Scanner (**advanced-ip-scanner.com**) can help here. It will scan any range of network addresses (it defaults to whatever subnet your computer is on) and report back with a list detailing not only the names and IP addresses of all discovered devices, but also the manufacturer information, where available.

This can sometimes be the manufacturer of the network card rather than the device itself, but it can still help you identify which device is which – and you can add your own comments to individual MAC addresses for easy future reference. It's perfect for discovering any low-trust devices connected to your primary network, or exposing anything that shouldn't be on the network at all, such as your neighbour's iPhone.

TAME YOUR STARTUP ITEMS

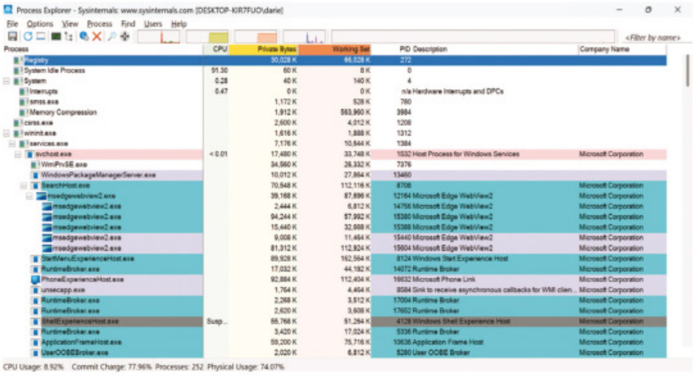
Being a network administrator means taking full ownership of everything that's running on each computer. Unfortunately, Windows systems tend to get clogged up with programs that launch automatically each time you start up the computer. Aside from security concerns, these can slow down the machine or pester you with unwanted interruptions.

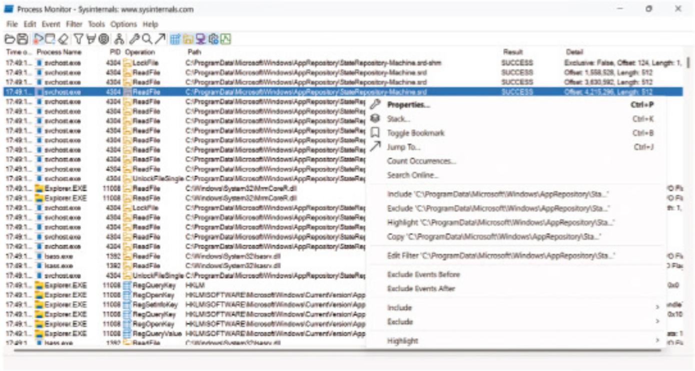
You can view a list of "autorun" programs from the Task Manager. Clicking the fifth icon down in the sidebar (which looks, rather unintuitively, like a speedometer needle) brings up a list of self-starting programs, and provides an easy way to disable anything you don't like the look of.

That's nowhere near the whole story, however. For a more in-depth look, download the free Sysinternals Autoruns program from **tinyurl.com/APC551autoruns**. This gives you a comprehensive readout of every process that executes when you boot up Windows and log on, including not just conventional startup items but device drivers, printing components, Explorer extensions and more.

Each item is shown with a description if available, and a path to exactly where the file is located on your hard disk. Right-click on any item and you can do all sorts of useful things, including deleting it, jumping to its location on disk, checking it against the VirusTotal malware database and searching for more information about it online.

In truth, the sheer volume of information Autoruns provides can be





overwhelming. For this reason there are 19 filter buttons at the top, which you can click to see only items of certain types.

MANAGE RUNNING PROCESSES

Two other Sysinternals tools can help you keep a more general eye on what's running on a Windows machine. Process Explorer (**tinyurl.com/APC551process**) is like Task Manager with the guardrails removed: it breaks down absolutely everything that's running on your PC right now, with a far greater degree of detail and control than Windows' built-in tool. You can hover your mouse pointer over any item to see details of exactly how it was launched, and from where; a particularly powerful feature is that you can also search for which process is accessing a specific file using the Find | Handle or DLL menu option.

Don't ignore Process Monitor, either (**tinyurl.com/APC551monitor**). This expert utility doesn't just show you which programs are running, it exposes exactly what files (and Registry keys) they're reading and writing.

When you first run it, the window will instantly fill up with thousands of entries every second, from all the different processes running in a multitasking operating system. Fear not: you can calm the flood using Process Monitor's powerful filtering options. Just right-click on a process name, operation or path and you'll see options to include or exclude matching items from the display.

ABOVE Process Explorer provides a complete overview of everything running on a PC.

ABOVE RIGHT Process Monitor records all file-system and Registry activity.

BELOW Windows can automatically try to free up hard disk space.

Used in combination with the built-in search option, Process Monitor's filters let you quickly zero in on items of interest. You can then see for yourself exactly what a particular executable is doing, or identify which process is meddling with your files. Just note that the tool works in real-time, so it won't be able to tell you about things that happened before you opened it.

ADVENTURES IN SPACE AND BANDWIDTH

Windows can misbehave when disk space gets low, and if you run out of storage entirely that's obviously going to affect your ability to get things done. Two utilities built into Windows can help you manage local drive space: the classic Disk Clean-up tool will find and remove old, unneeded downloads, caches and update files, while Storage Sense (located in the Windows 11 Settings app) can automatically clean up extraneous files when disk space is low, or to a user-selectable schedule.

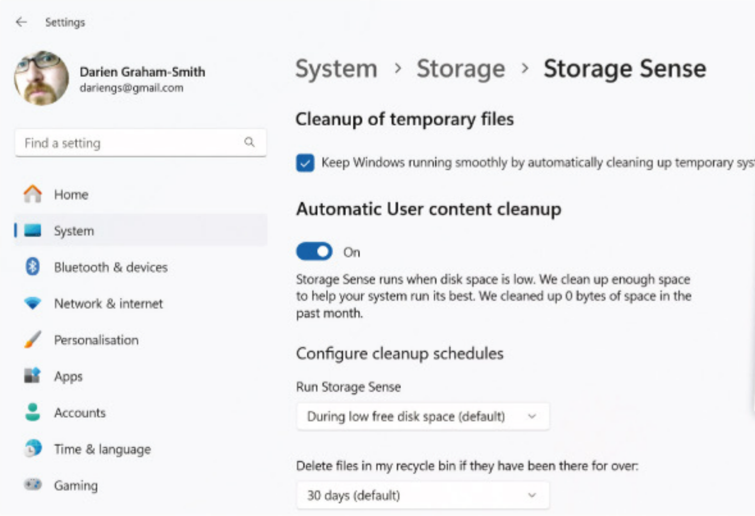
For a more detailed breakdown of exactly what's taking up space, you'll want to turn to third-party tools. The free WinDirStat utility (**windirstat.net**) will scan any drive or volume – including network locations – and present an expandable tree view of all its folders and subdirectories, along with the size of each one on your disk. Below this, a handy graphical visualisation of the layout of your file system lets you instantly spot where the biggest files are hiding.

As well as trimming unwanted process and files from individual computers, check whether you can accelerate your network with a little traffic management. Many routers have built-in tools to break down traffic by client, so you can see if one device is eating up all the bandwidth. You can also break down traffic by type, making it easy to spot if your internet connection is being bogged down by games and BitTorrent downloads. Most routers offer more or less sophisticated QoS (quality of service) settings that you can use to prioritise clients and/or types of traffic.

FOLLOW THE SCRIPT

Professionals know that the secret to administration is automation – making sure your essential tasks get done reliably and efficiently by the computer, so you don't have to remember to do them by hand.

For this purpose, the Windows Task Scheduler is an amazingly powerful tool. Open it by simply searching for its name from the Start menu. You can



System › Storage › Storage Sense

Cleanup of temporary files

☑ Keep Windows running smoothly by automatically cleaning up temporary syste

Automatic User content cleanup

On

Storage Sense runs when disk space is low. We clean up enough space to help your system run its best. We cleaned up 0 bytes of space in the past month.

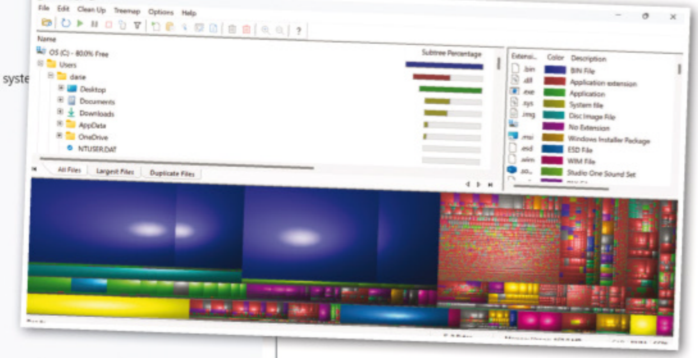
Configure cleanup schedules

Run Storage Sense

During low free disk space (default)

Delete files in my recycle bin if they have been there for over:

30 days (default)



ABOVE Wondering where all your disk space has gone? WinDirStat exposes the biggest files.

configure it to run any command or program when a set trigger condition is met, which might be a schedule, a user logging on or some other event.

What makes the Task Scheduler particularly powerful is that it can launch batch files and scripts written in PowerShell, Python or any other language you care to name. This means pretty much any task that you need to do on a regular basis – either for housekeeping purposes or as part of your workflow – can be delegated to run automatically at whatever intervals you desire.

With a little external help, it's even possible to automate tasks that would ordinarily require interactive mouse input. The free AutoHotkey scripting host (**autohotkey.com**) lets you create scripts that simulate mouse movements and button presses, to automate programs that don't offer a regular scripting interface.

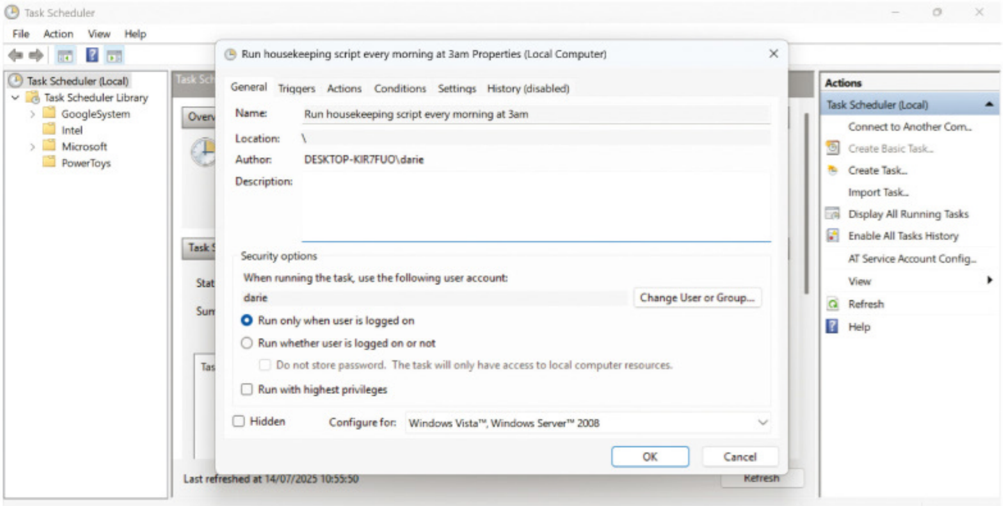
AutoHotkey can also be used to create custom keyboard shortcuts (hence the name). For example, you could program it to copy all the files from a specified folder to a backup destination every time you press Ctrl+Shift+B.

REMOTE ACCESS

If you're managing a network of multiple devices, setting up remote desktop access – so you don't need to physically visit different computers to find and fix potential problems – can be a real time-saver. Windows 10 and 11 Pro include Microsoft's business-grade Remote Desktop technology, but if you're looking for a solution that will work on Home editions of the OS, Microsoft Quick Assist could fit the bill. It's a free download from the Microsoft Store and lets users share a connection code with a trusted third party to grant desktop access.

For connecting to unattended computers – or non-Windows ones – you'll need to explore other systems. There are plenty of commercial remote-desktop tools that allow free personal use, such as RustDesk (**rustdesk.com**) and TeamViewer (**teamviewer.com**), but they may block you without warning if your usage strays into quasi-professional territory.

A fully free alternative is the open-source TightVNC (**tightvnc.com**). This works on all editions of Windows, plus macOS and Linux systems, but it doesn't use a central hub – so you may need to configure your router's firewall to allow direct connections from one computer to another, and set up port-forwarding rules if you want to enable remote desktop access over the internet.



Run housekeeping script every morning at 3am Properties (Local Computer)

Name: Run housekeeping script every morning at 3am
Location: \
Author: DESKTOP-KIR7FUO\darie
Description:

Security options
When running the task, use the following user account:
darie
● Run only when user is logged on
○ Run whether user is logged on or not
☐ Do not store password. The task will only have access to local computer resources.
☐ Run with highest privileges
☐ Hidden
Configure for: Windows Vista™, Windows Server™ 2008

ABOVE Task Scheduler runs programs and scripts at preset times automatically.

GETTING YOUR BACK UP

Any IT administrator will tell you that backup is one of their most important responsibilities. Unfortunately, Microsoft has deprecated the useful Backup and File History tools that used to be integral features of Windows – presumably because it wants you to use OneDrive instead, and to pay for the online storage.

Still, there are plenty of alternative tools to choose from, many of them free. If you want to back up your network like a professional, one option we'd draw your attention to is enterprise backup specialist Veeam (**veeam.com**), which offers a free community edition of its software that can protect up to ten Windows and Linux clients – more than enough to cover a typical home network.

Veeam can back up not only critical files but complete system images too, which can save you a lot of time and bother in the event of a serious failure. As well as fully restoring a working system, Veeam images can be mounted as virtual machines, so you can easily dip into a past system state to check old files, applications and settings. Find out more and download it from **tinyurl.com/APC551veeam**.

For simpler, ad hoc file duplication, we'll also mention a lightweight tool called FreeFileSync (**freefilesync.org**). This tiny utility runs on Windows, macOS and Linux, and automatically replicates the contents of any specified folder to a set destination, such as a NAS appliance or external hard disk. It works very efficiently because it only copies new and updated data, and sync tasks can be triggered from a script or batch file. Note, though, that FreeFileSync is designed for mirroring, not archival: it doesn't keep older versions of updated files, so it's not a complete backup solution on its own.

Finally, one last piece of wisdom from the business world: don't blindly trust your backup software, but make a point of regularly checking backups, to see that all the latest files are there, and that you can copy them back and open them without issue. It's all too easy to configure an automatic tool that looks like it's doing the right thing – right up until the day when a computer failure or virus hits. ■

MAKE AN INCIDENT RESPONSE PLAN

Every business needs a cyber-incident response plan to ensure that any attacks are handled effectively and consistently. If you're looking after a home network, or providing informal remote support for friends and family members, you too can benefit from drawing up some simple instructions ahead of time. You might find it helpful to follow this four-phase structure as recommended for many corporate response plans:

1 EVALUATE

What should your friends and family be looking out for? How can they identify an incident? You don't want to alarm them, but you don't want them to overlook suspicious behaviour either.

2 INFORM

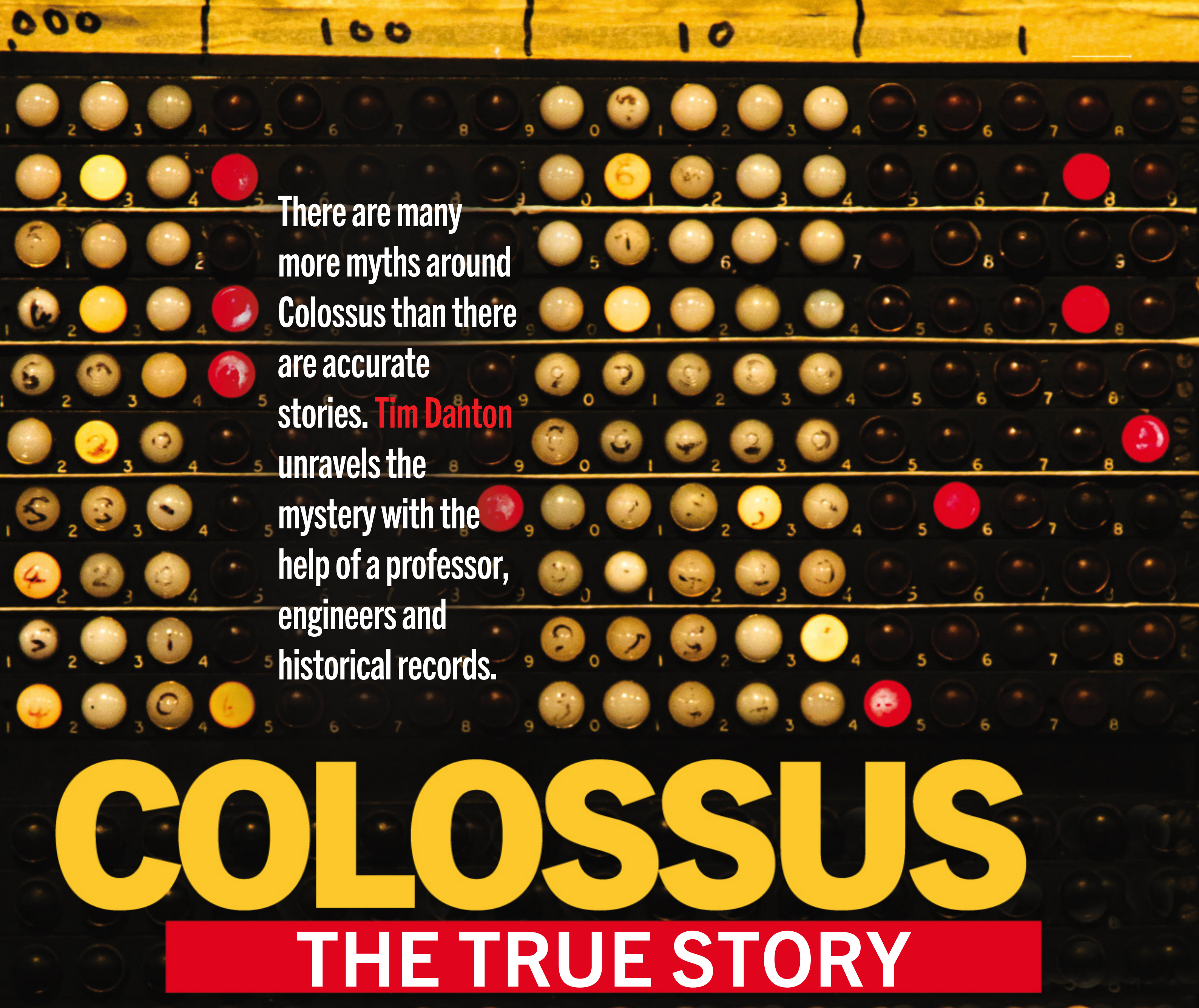
Tell them the best way to reach you in a cyber-emergency and spell out exactly what you need to know – so hopefully when the call comes it will say something more illuminating than "the web page went funny".

4 COORDINATE

Set out what you want the person experiencing the suspected attack to do independently, without waiting for your response – and, for your own clarity as much as theirs, write down what you intend to do, too.

4 UPDATE

The first time you try to execute your plan you will inevitably run into unanswered questions and unexpected pitfalls – but if you learn from each incident and update your plan accordingly, over time it will become more and more watertight. Ideally, it's worth carrying out drills rather than waiting for a real attack.



There are many more myths around Colossus than there are accurate stories. Tim Danton unravels the mystery with the help of a professor, engineers and historical records.

COLOSSUS

THE TRUE STORY

On 1 September 1939, Post Office engineer Tommy Flowers found himself in Berlin to take part in a European conference about telephone systems. Germany invaded Poland the same day.

Flowers and a fellow British delegate went to the British embassy to let them know where they were staying. “The young man at the embassy… looked at us and said, ‘You people must be mad, there’s going to be a war in a few days’,” Flowers said in 1998. “Which surprised us a bit.”

The British duo spent the next day with their German counterparts on the committee, trying to play it cool, but the next morning the embassy called to say they had to catch the next train out or else. A tense eight-hour journey through Germany followed, but the men were back in London by 8am on 3 September.

It had been a lucky escape for both men. Many British citizens unfortunate enough to be in Germany on the day Britain declared war were detained at internment camps until VE Day in May 1945. It was an even luckier escape for the British war effort, because without Tommy Flowers there would have been no Colossus – and without Colossus, the Allies’ path to Germany would have cost many more lives, on both sides.

Flowers and valves

To understand why Tommy Flowers was so intrinsic to Colossus, we need to go back to 1926, at which point Flowers was still only 20, when the General Post Office (GPO) decided to accelerate its move to automatic telephone exchanges. Desperate to modernise, the GPO needed engineers and they needed them fast. So they invited school leavers to take an examination, with the best performers invited to join the scheme. And Tommy Flowers, it turns out, was the best of the lot, beating hundreds of others to top the exam scores.

Within three months of starting, Flowers said he was “yanked out of” general training and sent to the GPO’s Circuit Laboratory. It was Flowers’ job – along with everyone else in the lab – to design new circuits based on electromagnetic relays that could be rolled out in exchanges. Much of his work was akin to programming today, but rather than coding in software, Flowers was coding in hardware. First it was a matter of designing the circuits, then testing them to see if they worked as desired.

The Post Office installed London’s first automatic exchange in Holborn in 1927, and by the time Flowers left the Circuit Laboratory in 1930 “we were well advanced, we got a lot of exchanges working, and they were working reasonably well.” He left to join the Post Office Research Station in Dollis Hill, where he was assigned to work with a senior engineer who was studying the problem of long-distance dialling.

“With ordinary electricity in wires, the limit to the distance is about 40 miles,” said Flowers. Voices would become too faint to hear. “This chap I was put with was saddled with the problem [but] wasn’t getting anywhere because he wasn’t any good… but after about six months, during which time I almost went barmy, he was then promoted. If you had someone on your staff who wasn’t any good, the only way to get rid of him was to get him promoted.”

When Flowers was given the job to solve, he turned to thermionic valves. He realised that not only could these replace electromechanical switches, and work thousands of times faster, they could also be used to amplify people’s voices. By the outbreak of war in 1939, his valve-based system had moved out of the lab and into production. The Research Station also had a new boss in the form of Gordon Radley, who Flowers described as a “warped genius”. Radley had an astounding memory for detail and he needed it, as the Dollis Hill team stopped all civil tasks and focused instead on the war effort.

Flowers spent the early part of the war working out the best way to transmit data from radar stations on the coast to Fighter Command in Stanmore, London. It wasn’t until early 1942 that he signed the Official Secrets Act and was informed of the code-breaking work being done at Bletchley Park. From that point on, revealing anything about his work with the Government Code and Cypher School (GC&CS) would be treason.

ABOVE GPO staff in the telephone exchange at the Ministry of Information in 1941.

LEFT INSERT Colossus wouldn’t have been built without the genius of Tommy Flowers.

RIGHT A new type of encrypted message was received by teleprinter in 1940.

> **Without Colossus, the Allies’ path to Germany would have cost many more lives**

The listening game

We should briefly pause to mention a side of Britain’s code-breaking weaponry that rarely gets a mention: the radio listening stations, called Y stations, that intercepted enemy communications. “They were kind of the front wall, they were picking up the messages, and if it hadn’t been for them, there would have been nothing for the code breakers to break,” says Jack Copeland, professor of logic at the University of Canterbury in New Zealand, and a world authority on the Colossus.

One visit to a Y station concerned a different code-breaking challenge: a new type of signal had been picked up by one of the stations in the latter half of 1940, with more following in early 1941. Quite unlike Enigma, which transmitted in Morse code, messages of this new type were sent as teleprinter code. Here, each character is represented by a five-strong pattern of pulses and non-pulses. Y, for instance, is pulse-gap-pulse-gap-pulse. Or 10101 in binary notation.

Initially, the existence of these pulses was merely noted. There was too much else to do. It was only in June 1941, when an RAF station near Folkestone intercepted an unencrypted message revealing military details, that Britain’s network of intercept stations began to record them. Naturally, these messages – now encrypted with an unfamiliar cipher – were sent to Bletchley Park for examination.

By the end of August 1941, Bletchley Park knew several things about these non-Morse broadcasts. Crucially, they knew they were encrypted using the Vernam cipher, which added a "random" value to each of the five dots or crosses (called impulses) that made up a character in the teleprinter code. So, if you were to encrypt Y (10101) with the encrypting key of J (11010), then the new enciphered character would be the sum of its parts. Adding the first impulses together means adding 1 to 1, giving the "answer" 0 (note there is no carryover to worry about here, which is why 1 plus 1 is 0). For the second component, we're adding 0 to 1, so the answer is 1. Going through all five components, Y + J is 01111, otherwise known as the pulses • x x x x . That is, the letter T.

One more crucial thing to understand about the Vernam cipher the Nazis were using is that you decrypt by applying the same key. So, adding T (01111) to the encrypting key J (11010) gives you the original character Y (10101).

Bletchley geniuses

To understand Colossus, we don't need to go into all the work done to break this new code, referred to as Tunny. But break it the great minds at Bletchley Park did, with the unwitting help of the German military. Believing that their code was unbreakable, they provided the opening settings of the 12 wheels in the "Tunny machines" via the first 12 characters of each message.

Such complacency couldn't last forever. In November 1942, they issued a code book to Tunny operators. Rather than provide the 12 wheel settings, the operators were given a reference number that they looked up in the book to discover the starting positions for the wheels. Suddenly, Bletchley Park was plunged into near-darkness unless two messages were sent with the same indicator (called a depth). This allowed the British code breakers to apply a method devised by Alan Turing – called Turingery – that could extract the wheel settings.

Bletchley Park couldn't wait for depths; too many messages were left encrypted and unread. Fortunately, the brilliant Bill Tutte devised a way to work out the starting positions of the first two wheels by applying statistical methods to Turingery. His so-called "1+2 break" meant that with enough time the code breakers could detect the most likely wheel start positions by counting (and adding) the dots and crosses of each individual letter.

The core idea was to "add" each letter (remember, it could be broken into a series of zeros and ones) in the encrypted message to every possible combination of encrypting key from the first two wheels, then count up the dots. Then slide it along by one and repeat the process. And so on until you had tried all the different possible streams. Tutte worked out that if around 54% of the individual pulses were zeros when totalled up, the wheel settings were almost certainly correct.

Bill Tutte 1917 - 2002
Newmarket Town Council

ABOVE Bill Tutte's contribution is celebrated, as here in Newmarket, but not nearly as much as it should be.

But the sharper-eyed reader would have spotted the phrase "enough time" above, which hides a large problem. Enough time could mean centuries for some messages. Even though they only needed to deduce a pair of wheel settings to begin the process, that meant 1,271 (41 x 31) different scans of the text to spot likely candidates. And as this was a statistical method, they needed long messages, not short ones.

All of which meant they needed a much quicker way to count and add – and that meant some form of automatic adding machine. Tutte took his 1+2 break theory to Captain Gerry Morgan and Max Newman, two of the most senior figures at Bletchley Park. In what historian Jack Copeland describes as "a moment of inspiration", Newman realised that one of his University of Cambridge colleagues, Eryl Wynn-Williams, had already designed an electronic counter based on valves that he thought could be adapted for this crucial part of the job. He called in Wynn-Williams to take control of that side of the design, with the GPO in charge of creating the drive mechanism for the tapes, the photoelectric readers to detect dots and crosses as they passed, and a combining unit to add up the numbers.

Two exceptional GPO engineers, Eric Speight and Arnold Lynch, produced the photoelectric readers, but the combining unit – which used electromagnetic relays – proved more challenging. It was time to call in the expert, Tommy Flowers.

"I quickly came to the conclusion that the [machine] would never be any good, that we were wasting time on it," said Flowers. In particular, he was extremely sceptical about keeping two tapes in perfect synchronisation. One run with a long message, he pointed out, could take several hours and that would surely be too much for paper tape to stand. "So I thought up something different."

Flowers' key idea was that by using thermionic valves as switches "an analogue of the coding machine could be made". So no need for tape, as the data would be stored within the machine.

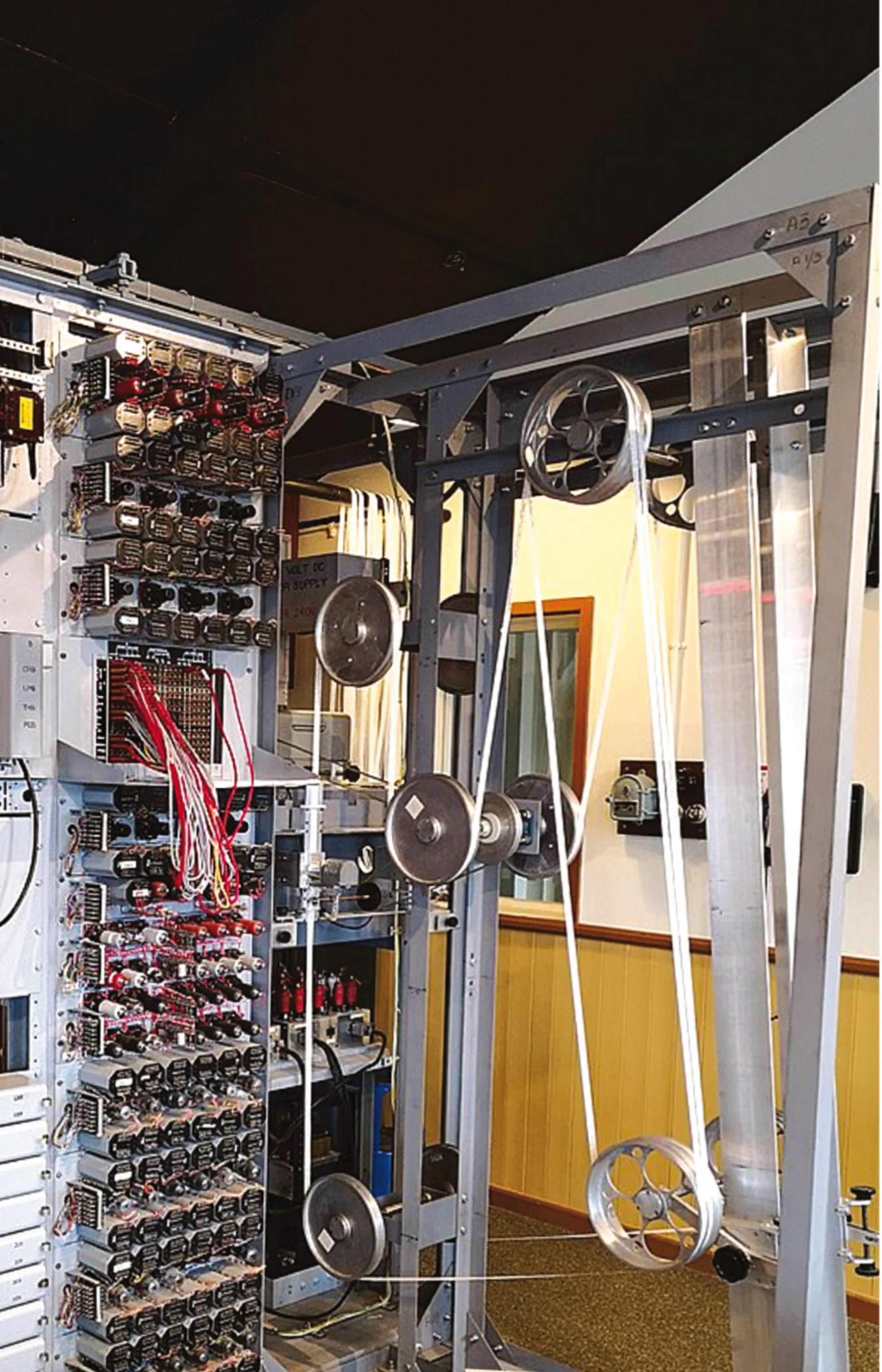
While Flowers was convinced his solution would work, he struggled to persuade the Bletchley Park hierarchy. This was partly due to thermionic valves' poor reputation for reliability – used in radio sets and early TVs, they were vulnerable if moved and were well known for their limited operational life – but Flowers had built automatic exchanges with hundreds of valves in them, and knew that they would prove extremely reliable so long as they were kept switched on.

RIGHT Thermionic valves didn't have a great reputation for reliability when Flowers suggested them.

When Newman asked Flowers how long it would take to build, the Post Office engineer gave the honest reply of at least a year. "[Newman] said, well, they just couldn't wait a year; in a year the war could be over and lost," said Flowers.

Rise of the machines

Despite this, Newman cautiously welcomed Flowers' ideas. In a report dated 1 March 1943, he wrote: "I feel that this is basically the right sort



of approach… At the same time, since there is a risk of hold-ups along these new paths, I emphasised that the simpler tape-machine (which also has the advantage of easy adaptability to all sorts of purposes) should be gone on with also, at full speed."

By June, the first two-tape machine – featuring a combining unit that Flowers and his team developed as per the original request – was delivered to Bletchley Park. It was quite something to behold. So much so that it was named the "Heath Robinson" by the Wrens who operated it due to its elaborate, cumbersome design. It worked, but only after weeks of effort by Newmanry section members Jack Good and Donald Michie. Bletchley Park ordered more, and an improved, finessed version arrived in November.

While Bletchley Park wouldn't commit money to Flowers' electronic solution, they told the General Post Office that it could go ahead with the design at its own risk and cost. Fortunately, Flowers had the backing of his boss Gordon Radley, who gave his chief engineer access to all the materials and people he required.

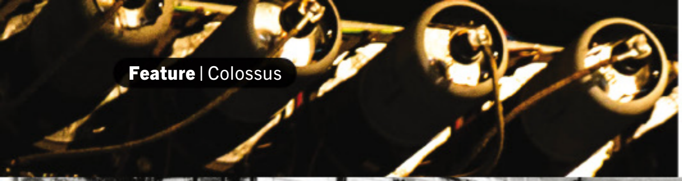
"I knew what it would do," said Flowers. "I drew a lot of square boxes, with lines joining up to these, and I specified what each box had to do." For example, how each box would simulate one of the code wheels. Flowers had to work alone until others could be let into the secret, but was soon joined by talented colleagues.

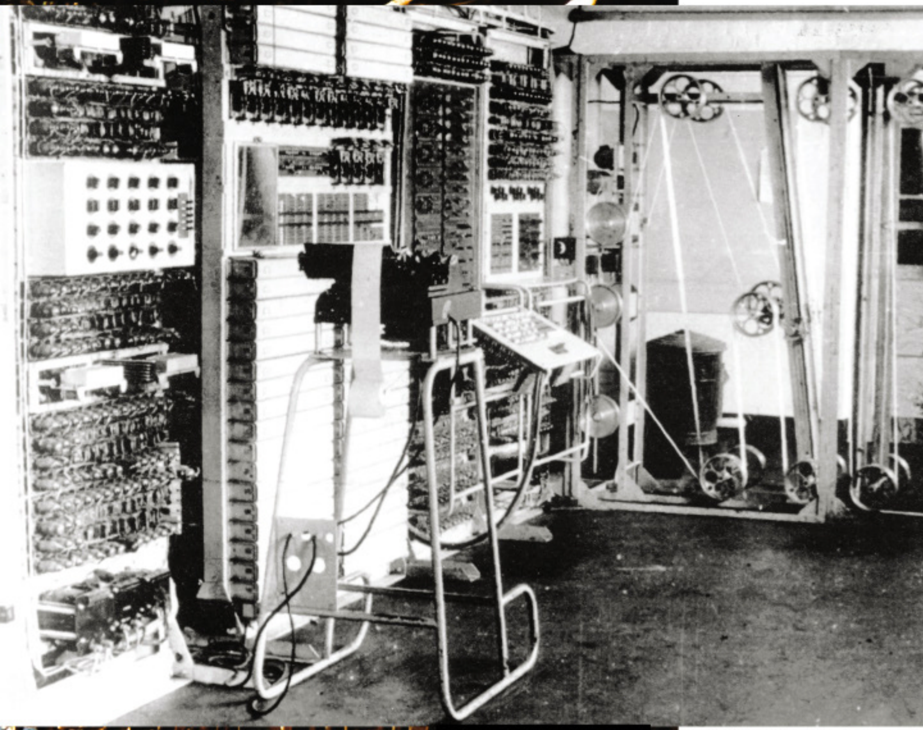
"Sid Broadhurst was a master of system design, and of the logic and timing of complicated relay circuits," wrote Harry Fensom, another member of the team at Dollis Hill, in his article "How Colossus was Built and Operated – One of its Engineers Reveals its Secrets". "Bill Chandler was the expert on digital valve design, and could produce a system that worked straight away when implemented from the drawing board."

In fact, while some histories simplify the computer's story and say that Tommy Flowers "built" the Colossus, he had a large team of engineers working alongside him in the lab, plus the considerable manufacturing power of the GPO to draw upon.

Flowers started designing the first Colossus in February 1943, with the machine delivered to Bletchley on 18 January 1944 and operational on 5 February. So, a year later, just

RIGHT The first two-tape machine was named the "Heath Robinson" by the Wrens who operated it.





ABOVE This shows the circuitry and pulley-wheel system, where the encrypted message was placed.

RIGHT Crowds, aside from one unhappy child, celebrating VE Day in Piccadilly on 8 May 1945.

HUNDS
TENS
THOUS
START COUNTER

as Flowers had predicted. It filled a room, more than justifying its name. While the machine was loud – thanks to the use of many electromechanical parts, not the valves – it worked from the get-go.

In his seminal report "The Colossus", computer historian Brian Randell quotes Flowers directly: "They just couldn't believe it when we brought this string and sealing wax sort of thing in and it actually did a job. They were on their beam ends at the time, Robinson just hadn't got enough output, they wouldn't go fast enough, and suddenly this bit of string and sealing wax, in about ten minutes… and then they started to take notice!"

Gordon Radley's wartime diary is more measured in its analysis, but still the delight at its success rings through. "Since February 22nd Colossus has been in full daily operation for 16 hours per day, and, although the operating staff are not yet sufficiently familiar with it to utilise it to the best advantage, it has dealt with eight messages in 11 hours. For the remaining eight hours of its day, Colossus is turned over for the attention of Research Staff who are endeavouring to graft on to it equipment for providing still further facilities."

Following orders

Flowers and Radley expected Bletchley Park to immediately place orders for more machines, so were surprised when they didn't hear anything. Still, they decided to press ahead with the manufacture of the more time-consuming components so that they would be ready when the call came.

It's a good thing they had a head start, because the following month they were visited by "some man in uniform, straight from the War Cabinet, [who said] that we had to make 12 of these machines by 1 June," remembered Flowers. By then it was obvious to all that it was only a matter of time before the Allies invaded Europe, and their visitor's next statement made Flowers suspect that his machines might just play an important role. "We were told that unless you can make these machines and have them working by 1 June then it would be too late."

While the GPO couldn't build a dozen machines in such a short time, Flowers promised that the first new machine would be working by 1 June, with the next two following in July and August. So began an intense four months of effort to build the Colossus II, this time with 2,400 valves. "We worked day and night, six days a week," said Flowers. "We worked ourselves almost to exhaustion."

That work continued right up until the last moment. Only at 1am on the morning of 1 June 1944 did Flowers and his team work out that the reason the Colossus II obstinately refused to work was due to misbehaving valves. This was a problem best left to valve expert William Chandler, so they left him there. "And then Flowers came back the next morning and Colossus II was buzzing away like a top," says Copeland. "Chandler was looking very pleased with himself, but also standing in a pool of water because the radiator had leaked during the night." This, incidentally, is why some reports incorrectly state that the Colossus was water-cooled; ignore all such articles.

"Between [5am] and 8pm this evening, Colossus II was running continuously and has very successfully dealt with no less than 20 separate tasks," wrote Radley in his diary that day. "This is roughly equivalent to a full 24-hour output from all the other machines at present operated by the Group concerned, and has given very great satisfaction to Professor Newman and Commander Travis."

The Colossus II was so quick thanks to the advent of what can best be described as parallel processing. This involved having the equivalent of five processors working on the same tape, effectively bringing the speed up to 25,000 characters per second. "It meant more gates and counters, of course," wrote Fensom, "but we didn't mind a thousand extra valves."

Nor did Bletchley Park mind throwing hundreds of women at the problem. For while the Colossi revealed the settings for the five chi-wheels, there was still much work to be done before a message could be decrypted, and much of this burden fell to Wrens and women from the army's Auxiliary Territorial Service.

"There were so many messages being sent in, when one didn't come good you were sent another one," Cora Jarman told Tessa Dunlop, author of *The Bletchley Girls*, of her time in the Newmanry. "Checking checking. It was very boring."

After a Colossus had successfully revealed a likely set of starting positions for the chi-wheels, the message needed to be 'de-chi'ed'. This meant processing it through a machine to remove the chi encryption, which one of the women would do. The de-chi'ed message tape would then be taken to the Testery, where the code breakers would set to work. When a complete set of wheel positions arrived, it was women who would set up a Tunny machine and check the output.

So it was hard work for everyone involved, but also vital work. According to legend, on 5 June 1944, General Eisenhower was handed a decrypt fresh from Bletchley Park. He read it, then declared: "We go tomorrow." This may be too neat a story, but it's certainly known that Eisenhower was a regular visitor to Bletchley Park in the run-up to D-Day and an admirer of its work.

The Colossus effect

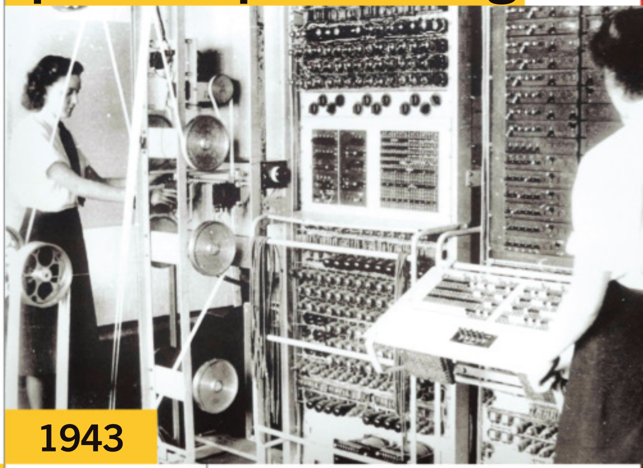
We should not oversimplify history to say that the Colossi alone won or shortened the war. Giving all the credit to the computer ignores the months of work done by a network of double agents who had been feeding the Nazis with misinformation. Not to mention other ruses, such as creating fake barracks near Dover, or dropping aluminium foil to create the illusion of incoming planes on German radar. All these deceptions were to convince the German military that the Allies were going to land in Pas-de-Calais rather than their real target of Normandy.

The deception worked. The Nazis held back reinforcements from Normandy, allowing the Allies to establish a strong foothold there. Over the coming months, as the Allies battled their way across Europe, more Colossi were installed. By the end of 1944, seven whirred away, spread across two vast, bomb-proof concrete buildings. Three more Colossi arrived in 1945. "I saw this astonishing machine the size of a room," said Joanna Chorley. "It was ticking away, and the tapes were going round and all the valves, and I thought what an amazing machine… Like magic and science combined!"

What's more, the machines became more magical over time. For example, Bill Tutte created a technique called rectangling that could determine the wheel patterns. However, it required a quite legendary amount of effort by hand, and one tiny mistake could ruin the calculations. Donald Michie, a talented member of the Testery, came up with a proposal that meant a Colossus could become a high-speed rectangling machine through the addition of a "rectangling gadget". A good thing, as the Germans started to change the wheel patterns on a daily basis as they became more concerned about security.

"We were in no doubt about how important [Colossus] was," said Capt Jerry Roberts, a member of the Testery, in 2010. "We saw a number of messages signed by Adolf Hitler himself." The operation became slick, with Roberts adding that "I suspect sometimes we genuinely saw the messages before the blessed Germans".

The Colossus II was so quick thanks to what can best be described as parallel processing



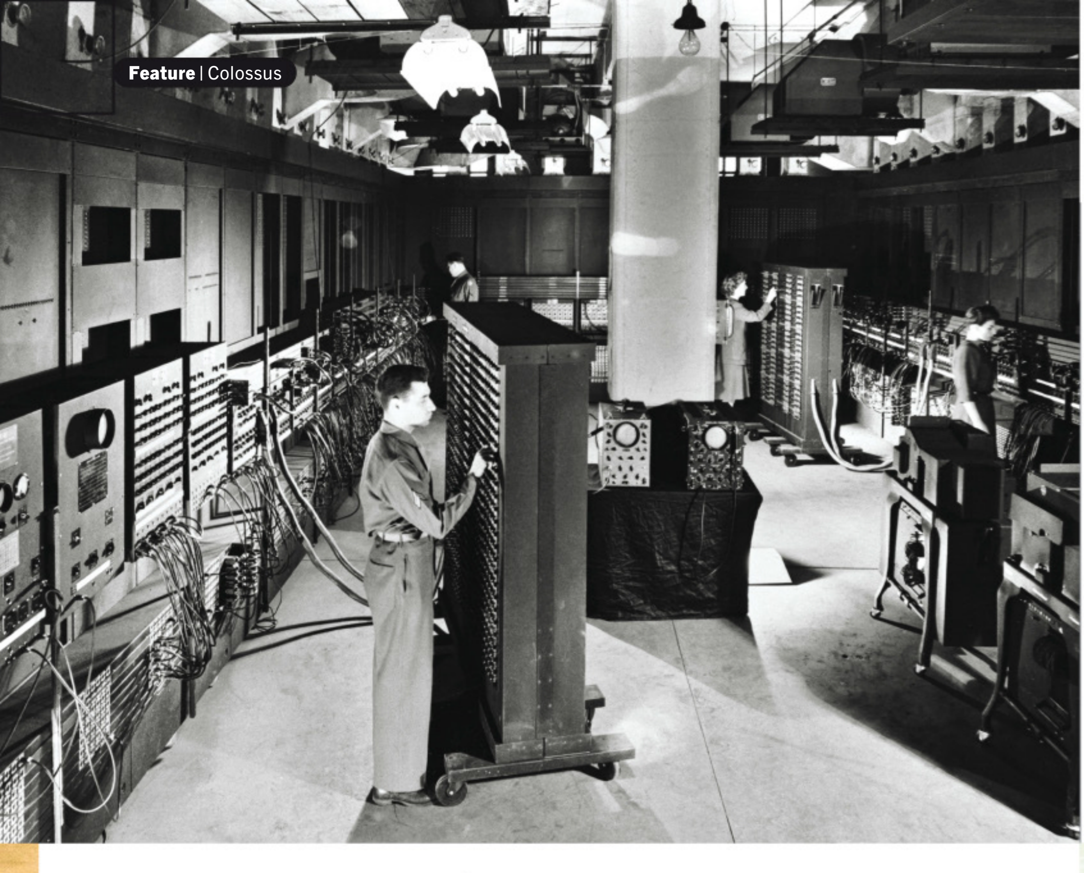
ABOVE Though much of the work was automated, hundreds of Wrens made it all work.

LEFT Colossus relied on Wrens such as (left to right) Irene Dixon, Lorna Cockayne, Shirley Wheeldon, Joanna Chorley and Margaret Mortimer.

For the rest of the war in Europe, the Colossi continued to break codes, with the tenth and final operational machine installed in April 1945. A month later, the teleprinters relaying the Tunny messages would fall silent – an eerie experience for those working in the huts – with the final message sent shortly before VE Day on 8 May 1945. This was the date when Nazi Germany unconditionally surrendered to the Allied forces.

Second life

A lack of new messages didn't spell the end for the Colossi. There was



ABOVE The Colossi pre-dated the USA's ENIAC, but the two computers were very different.

still much to be learnt from the backlog of messages still to be deciphered, including clues to the identities of British agents giving material to the Soviet Union. For while the USSR was an ally of sorts, it was always an uneasy relationship.

Moscow must have known about the British success decrypting Tunny, because British civil servant John Cairncross – later unmasked as the fifth member of the infamous Cambridge spy ring that included Kim Philby and Guy Burgess – gave them decrypts that he smuggled out of Bletchley Park by stuffing them down his trousers. But the USSR clearly didn't realise how comprehensively Tunny had been broken, as it grabbed the Nazi cipher machines and used them (with enhancements) to encrypt messages after the war.

However, there was no need to keep all ten active Colossi in service, so the command came to dismantle them. In a 2012 short film to celebrate the 70th anniversary of Colossus's birth, Google interviewed engineers and wirers who worked on the machines. Their most poignant remarks came when describing the Colossi's demise.

"When we had the order to dismantle all the equipment, the idea was to smash everything. Smash all the valves and everything else," remembered Roy Robinson. "Some of [the Colossi] were thrown down coal mines," added Albert Bareham. "The whole piece of equipment was dumped down a disused coal mine and things like that."

Even 70 years later, you can hear the disappointment in the voice of Margaret Bullen (née Boulton), who like other women "with nimbler fingers" helped with wiring and soldering, when she remembers the end of her time at Bletchley Park. "We carried on… until the war was over, and immediately we were told we could go," she said. "You felt cheated in a way that you'd worked so hard on it and that it was going to be no more."

None of them knew at the time that at least two Colossi survived the massacre. These were quietly transported to the new headquarters of GC&CS – renamed Government Communications Headquarters, GCHQ, the following year – in north-west London. The Colossi then moved with GCHQ to Cheltenham in 1951, where they continued to provide valuable code-breaking service for another decade.

"I worked as an engineer on Colossus for a year during the 1960s," wrote Bill Marshall, a former GCHQ engineer, in an article on GCHQ's website to mark Colossus's 80th anniversary. "I was told very little about the machine I was working on – what the machine was actually doing was not for me to know. My job was to repair it as necessary, using just a few circuit diagrams and no detailed user handbook."

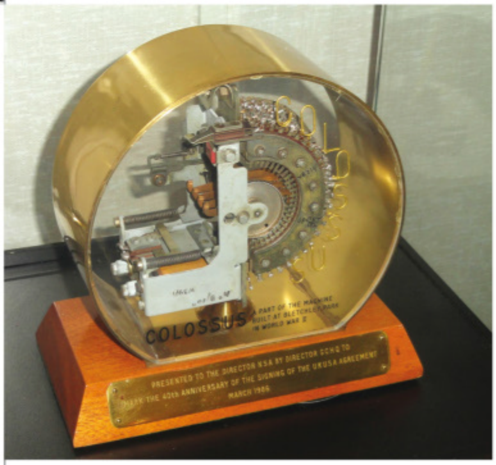
The truth unmasked

Despite the computers' retirement in the early 1960s, the government refused to declassify the Colossus project. It was only through the efforts of historians, particularly Brian Randell, that more information came to light in the mid-1970s. It took another quarter of a century for the government to release a 500-page report written by members of the Bletchley Park team, titled "General Report on Tunny", that filled in many of the missing details.

"ENIAC demonstrated very publicly the viability of using large numbers of electronic tubes," said Randell in an interview, "just as Colossus had done on a smaller scale, but privately. Colossus, I think, had an effect within Britain, but a rather limited effect, whereas ENIAC brought 'giant electronic brain' onto front pages."

This doesn't mean the Colossus should be ignored in computing history, as it marked many firsts. The Colossus I was the first computer to use electronic binary circuitry on a large scale. The first to use a clock pulse to synchronise operations. And while it was a special-purpose computer, it and its successors were programmable – to an extent.

Timing naturally becomes important when claiming world firsts, so it should be noted that the first Colossus was operational in February 1944, pre-dating the United States' ENIAC by almost two years. This was why, when Randell – with the assistance of Allen "Doc" Coombs – gave a guarded presentation on the Colossus to the International Research Conference on the History of Computing in Los Alamos in 1976 it caused quite a stir.



RIGHT One of the original Colossus switches, given to the director of the NSA in 1986.

Bob Bemer, who helped develop the ASCII character code, wrote a short but vivid article describing the proceedings. "I looked at Mauchly [John Mauchly, co-creator of ENIAC], who had thought up until that moment that he was involved in inventing the world's first electronic computer," he wrote. "I have heard the expression many times about jaws dropping, but I had really never seen it happen before. And [German Professor Konrad] Zuse – with a facial expression that could have been anguish."

All of which begs the question, what might have been different if the Colossi's creators hadn't been sworn to secrecy? Could it have given extra momentum to Britain's efforts? Might it have changed computing history? All questions we will never know the answer to.

What we know for certain is that Tommy Flowers, and others involved in the creation of the Colossus, never received the recognition they deserved in their lifetimes. It was only through the effort of Randell that Flowers gained greater recognition in later life. This included an honorary degree from Newcastle University in 1977 and the Charles Babbage award in the late 1990s, but it was only after his death in 1998 that the accolades truly flowed. There is now a blue plaque commemorating the Dollis Hill Research Station, while British Telecom – the organisation that inherited the Post Office's national telephone duties in 1981 – created a statue of Flowers at its research facility in 2013.

Colossus lives on

Colossus itself lives on in two forms. The first is a fully working recreation of Colossus II, created through the hard work of dozens of engineers but the dogged determination of one man: Tony Sale. "In 1991, some colleagues and I started the campaign to save Bletchley Park from demolition by property developers," he wrote. "At the same time I was working at the Science Museum in London restoring some early British computers. I believed it would be possible to rebuild Colossus, but nobody else believed me."

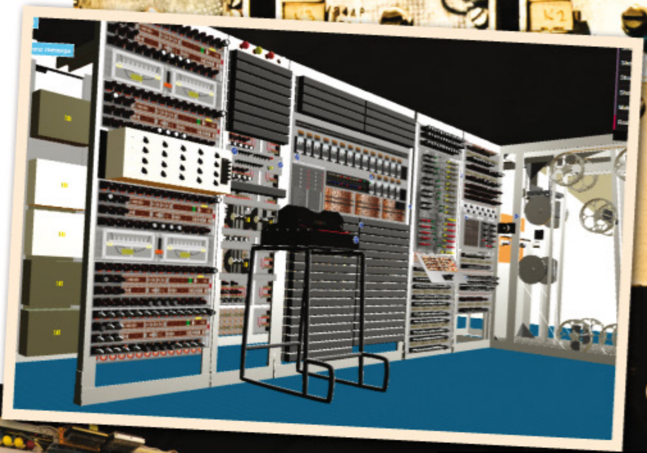
With the help of still-classified documents, circuit diagrams that engineers had illegally kept, and Arnold Lynch, one of the men behind the photoelectric reader, Sale first recreated the design. Then, this time helped by a mix of "current and retired Post Office and radio engineers", they built a limited version of the first Colossus – switching it on in time for the 50th anniversary of the ENIAC in 1996, a ceremony Tommy Flowers attended.

By 2003, after what Sale described as "over 6,000 man-days of effort", the replica of the first Colossus was working almost exactly as designed. But, not content with this, the team decided to "upgrade" to Colossus II. Their self-imposed deadline was 1 June 2004, exactly 60 years after the second computer became operational. This time, there would be no misbehaving valves. "[On] Thursday 20th May I filmed Colossus Mk 2 setting all five K wheels [psi-wheels] on the Bream cipher text and after editing, this video was shown to 120 people at our commemoration event at the Science Museum in London on 1st June 2004," wrote Sale.

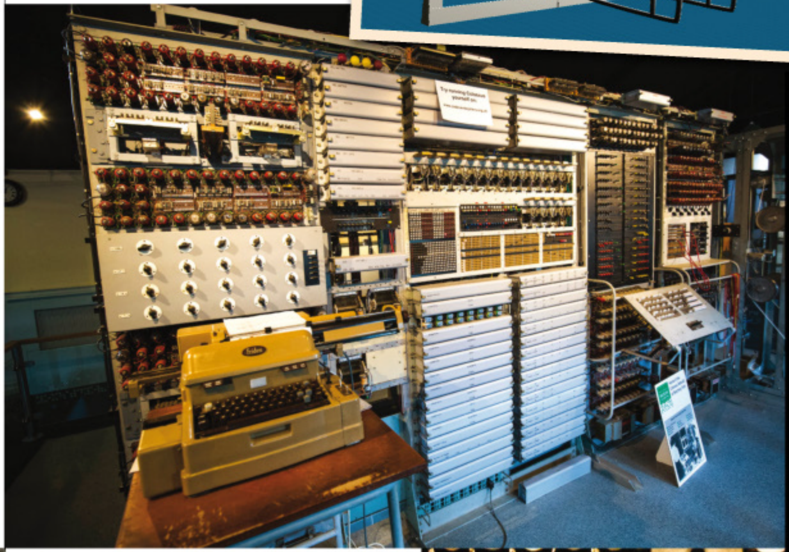
The rebuilt Colossus II remains on show at the National Museum of Computing, which is on the same site as Bletchley Park but is run separately. The museum also houses what it claims is the world's largest collection of historic computers and, unlike in most museums, visitors are encouraged to get hands-on with them. The Colossus is very much "look but don't touch", unless you're one of the volunteers who keep it going.

The Colossus is also kept alive by a virtual version – visit **virtualcolossus.co.uk** – where you can see a 3D representation of the computer and even set it to work. While the original program was written by Tony Sale, it was Martin Gillow who recreated it in 3D and brought it up to date.

All of which means that, despite the best efforts of the British government, the very modern legend of Colossus lives on. ■



ABOVE You can give the virtual Colossus a whirl online.

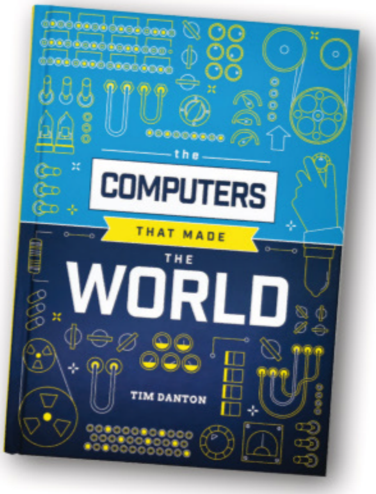


LEFT Colossus was rebuilt at the National Museum of Computing in Bletchley at the turn of the century.

BELOW The Colossus replica is looked after by a team of dedicated volunteers at Bletchley Park.

Buy the book!

This article is a shortened version of the full chapter in Tim Danton's new book, *The Computers that Made the World*, published by the Raspberry Pi Press. It's available from Amazon, Waterstones and from Raspberry Pi Press (**store.rpipress.cc**).



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The best tablet in the world becomes even better thanks to Apple's stunning M4 chip, a gorgeous OLED screen and the must-have accessory: the all-new Pencil Pro. But it comes with an obvious downside of cost, with the cheapest 13in incarnation costing $2,199.
From $2,199, apple.com.au

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$1,999, samsung.com

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We've seen several ultimate gaming monitors in recent months but, from the specs alone, Asus might just have made the most *ultimatest*: 480Hz refresh rate, matte-screen HDR OLED, 32-inch 4K.
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BenQ GW2790QT

Targeted at office users, this 27in, 1440p monitor is packed with quality, from its brilliant OSD to several clever features designed to fight eye fatigue. Text and images look sharp and punchy, its USB-C docking capability is always welcome.
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$479, canon.com

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$424, rog.asus.com/au

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Mesh Wi-fi

TP-Link Deco XE200

There are cheaper Wi-Fi 6E meshes, but the XE200 wins for its superb download speeds, excellent coverage and the fact that older clients reap benefits of 6E, not just new ones. And a two-pack should be enough for most premises.
$1,299 (2-pack), tp-ink.com

TP-Link Deco X20

The Deco X20 makes it possible to upgrade your home network to Wi-Fi 6 for the price of some standalone routers. The HomeCare functions are also a great bonus for households where lots of devices are fighting over the bandwidth. **$227 (2-pack), tp-link.com**

Asus ZenWiFi AX

The interface and design certainly aren't the prettiest (the charcoal version is straight out of the 1980s), but if you're after strong performance, great features and plenty of expansion potential, the ZenWiFi AX is a compelling prospect.
$939 (2-pack), asus.com/au

NAS servers

Asustor Nimbustor 4 Gen2 AS5404T

A particularly strong choice as a media server, the updated Nimbustor 4 is both flexible and quick. Asustor's Nimbustor 4 AS5404T is a four-drive NAS enclosure aimed at demanding home users or small offices.
$879, asustor.com

Synology DiskStation DS925+

Casual NAS users will find better value elsewhere. However, access to the vast, polished and professional Synology ecosystem will more-than justify the high price to buyers who make use of it.
$1,099, synology.com

Qnap TS-264

The Qnap TS-264 is aimed at those who want a bit more from a traditional two-bay NAS. It's effectively the two-bay version of the excellent four-bay TS-464, and provides strong speeds over its pair of 2.5GbE ports – and includes two M.2 NVMe slots.
$729, qnap.com

Security software

Avast Ultimate

Buy from retail and this is a bargain, with a solid VPN, anti-tracking software and handy detection fees on top of excellent protection.
~$65, 1 device, avast.com/en-au

THE ALTERNATIVES

G DATA TOTAL PROTECTION
Despite its quirks, G Data provides straightforward, effective and inexpensive protection against malware and other threats to your system. **1 device, US$50, avast.com**

AVAST ONE ESSENTIAL
Essential has the same malware-detection engine as our top choice, but for free. It even includes 5GB of VPN services per month and a few system optimisation tools.
Free, avast.com

NordVPN

NordVPN provides consistent and fast speeds, serious security, great support for video-streaming services and some cost-effective subscription rates.
$59 per year, nordvpn.com

THE ALTERNATIVES

PROTONVPN
ProtonVPN provided one of the best free offerings of all the VPNs in our group test, including unlimited data, but upgrade to benefit from even faster speeds and many more options.
Free, protonvpn.com

SURFSHARK
A strong rival to NordVPN, especially if you're willing to commit to its two-year contract. It's fast, cheap and a fine choice for people who like to switch to US streaming services.
$79.61 for one year, surfshark.com

Bitwarden

Bitwarden has a huge advantage: it's free. It isn't as slick as some paid-for rivals, but it can sync passwords across all devices for no extra charge. **Free, bitwarden.com**

THE ALTERNATIVES

DASHLANE
A manager that's ideal for beginners, and it even builds in an unlimited (if basic) VPN service. Note you may prefer to buy the Family plan ($60 per year) as this extends the service to six people.
$55.99 per year (Premium), dashlane.com

1PASSWORD
1Password is targeted at users who are looking for the last word in security. It even offers a Travel Mode that may ease your mind if surrendering your phone to customs officials.
$54.99 per year (individual), 1password.com

Market Watch

Mark Williams spotlights representative PCs in the market today.

PRICE $2,186 **WEB** tinyurl.com/APC551matrix

DIGITAL MATRIX INTEL 14TH GEN I5 5060

Sporting a best-in-class value CPU, it's a wonder why it's paired with the worst value in class GPU. Not that it's a bad pairing, but the RTX 5060 offers bottom-of-the-pack performance from the current generation, all while the system costs more than the likes of the MSY PC pick. It does at least offer you access to Nvidia's latest DLSS 4, which you may find need for more frequently than not as time goes on.

32GB of RAM and 1TB SSD are adequate for the price, along with the PSU. The air cooler will certainly keep the CPU temperatures tame as well. A perfectly fine system without any standout features.

SPECS **CPU** Intel Core i5-14400F; **Cooler** DeepCool AK400; **Motherboard** Asus B760M-AYW WIFI; **Graphics** MSI GeForce RTX 5060 8G Ventus 2X OC; **Memory** 32GB XPG Lancer Blade RGB DDR5 6000MT/s CL36; **Storage** 1TB Klevv Cras C910 PCIe 4.0 M.2 NVMe SSD; **Power Supply** MSI MAG A650BN 650W; **Case** Cougar Archon 2 Mesh.

PRICE $2,099 **WEB** tinyurl.com/APC551msy

MSY G5 - 58767

Coming in as the cheapest PC of the roundup, this sacrifices some CPU multithreading capability to squeeze in the best value in class GPU. The 16GB of VRAM offered here is also the largest of all the offerings in the roundup. As games become more demanding on VRAM, this stands to outlast the others longer term, all while offering comparable performance to the more expensive systems.

The 2TB SSD also sets it apart from all the other systems in this roundup, making for a fantastic choice for those wanting to watch their pennies while getting a good system that'll do well for a few years. Highly recommended.

SPECS **CPU** AMD Ryzen 5 7600; **Cooler** Thermaltake UX200 SE ARGB; **Motherboard** Gigabyte B650M Aorus Elite AX; **Graphics** Sapphire Pure AMD Radeon RX 9060 XT Gaming OC 16GB; **Memory** 32GB Adata XPG Lancer Blade 6000MT DDR5; **Storage** 2TB Corsair MP600 Core XT PCIe Gen4x4 NVMe M.2 SSD; **Power Supply** MSI MAG A650BNL 650W; **Case** Thermaltake View 170 TG ARGB.

PRICE $2,798 **WEB** tinyurl.com/APC551ware

IT WAREHOUSE SNOW WHITE TI D5

This cute system goes for looks with the all-white scheme, vertically mounted GPU and inbuilt LCD screen in the case. Compared to the MSY system, this has a slightly faster running CPU, though you'd be hard pressed to tell the difference. The graphics card steps up to the RTX 5060 Ti 8GB which'll offer around 5% more performance on average than the 9060 XT, however with 8GB of VRAM it'll be crippled by newer more demanding titles and hinder any benefits from frame generation.

The 750W PSU and AIO cooler are the last two things that help justify the dearest price in this roundup.

SPECS **CPU** AMD Ryzen 5 7600X; **Cooler** Thermaltake TH240 ARGB Sync Snow Edition AIO; **Motherboard** MSI B650M WiFi DDR5; **Graphics** GeForce RTX 5060 Ti 8GB GDDR7; **Memory** 32GB RGB DDR5 6400MHz; **Storage** 1TB Gen 4 NVMe M.2 PCIe SSD; **Power Supply** Thermaltake Toughpower GF A3 Snow 750W; **Case** Thermaltake Ceres 300.

PRICE $2,699 **WEB** tinyurl.com/APC551austin

AUSTIN COMPUTERS QUANTUMCROWN

Coming in marginally cheaper than the IT Warehouse system, this seemingly doesn't sacrifice anything to give you a more powerful 8-core 7700X CPU. With Ryzen's typically running so cool the AIO could've been dropped for an air cooler to allow for a 16GB version of the RTX 5060 Ti to give it a bit more legs in the long run, or a larger SSD.

As it is though, the AIO will certainly help keep system noise levels down and the PSU seems to have been what was downgraded slightly to fit the 8-core CPU into budget, a worthy choice.

This is definitely the better of the two dearer PC's this round.

SPECS **CPU** AMD Ryzen 7 7700X; **Cooler** Cooler Master Masterliquid ML240L V2 ARGB 240mm AIO; **Motherboard** Asus Prime B650M-A WIFI II-CSM-SI; **Graphics** Asus Prime RTX5060TI 8GB; **Memory** 32GB Corsair Vengeance RGB DDR5 DDR5 6400 CL36; **Storage** 1TB Crucial P310 1TB Gen4 NVMe SSD; **Power Supply** FSP HP2-700 Hydro Pro 700W **Case** FSP S380-BA.

YOUR NEXT PC

BLUEPRINTS

Build the best PC for your budget

BUDGET
ADVANCED
MID-RANGE
NZXT

KEY

Budget build

Pick these parts if you want to build a new, well-rounded PC for a good price.

Mid-range build

For productivity power and running every new game at 1080p 60fps. This recommended build will see you through.

Advanced build

You're looking for the best PC on the market and superior components. But you still want to spend smart.

BUDGET BUILD

Enjoy 1080p gaming and most tasks without breaking the bank.

TOTAL

$1,838

MOTHERBOARD

B760M Steel Legend WiFi

Asrock $249

This board is affordable, DDR5 ready, and packed with features, including Wi-Fi support.

PROCESSOR

Core i5 13400F

Intel $225

With ten cores, six of them the Performance kind, this Raptor Lake Core i5 is fantastic value and a great all-rounder.

GRAPHICS CARD

Radeon RX 9060 XT 8 GB

AMD $499

AMD delivers what we need for a 1080p gaming PC at a solid price, at least until even more budget GPU competition arrives.

COOLER

Laminar RM1 (included with CPU)

Intel Free

There's room for an upgrade here, but on a budget the included CPU cooler will work just fine.

MEMORY

Fury Beast 16 GB (2x 8 GB)

Kingston $112

We've made the switch to DDR5 here, as DDR4 is a bit old fashioned in 2025 and cheap kits are plentiful.

POWER SUPPLY

Pure Power 12 750W

Be Quiet! $179

This 750W power supply gives you a decent dose of headroom for some future upgrades, from a trusted manufacturer.

SSD

SN7100 1 TB

Western Digital $139

It's time to ditch SATA and go for an NVMe drive, even for a budget PC. You'll appreciate the extra speed and fast boot times.

CASE

NX200M

Antec $65

This Antec will let your components breathe and has space for further expansion and cooling.

DISPLAY

Gaming 27G4

AOC $164

AOC make some surprisingly cheap and well-specced little gaming monitors, like this 27in 180Hz 1080p display.

KEYBOARD

C3 Pro Wired

Keychron $59

It's actually mind blowing what you can pick up for this little cash: a USB mechanical board that looks lovely.

MOUSE

G305 Lightspeed

Logitech $69

Even on a budget you can still grab a fantastic, ultra-rapid wireless squeaker like this one here.

HEADSET

HS55 Stereo

Corsair $59

Corsair's budget wired cans are comfy and have a surprisingly excellent microphone for the money.

MOUSE PAD

MM100

Corsair $19

A simple black rectangle that can make a world of difference over no-name models, and it's almost as cheap, too.

MID-RANGE BUILD

Our recommended build for solid productivity and playing the latest games.

TOTAL

$3,083

MOTHERBOARD

TUF Gaming B650-E

Asus **$299**

A reliable motherboard with plenty of frills, including Wi-Fi 6E, 2.5Gb Ethernet, PCIe 5.0 for the SSD and USB-C on the back.

PROCESSOR

Ryzen 7 7700X

AMD **$529**

For the longevity offered by the AM5 socket, we're going for AMD's excellent eight-core Ryzen 7.

GRAPHICS CARD

RTX 5060 Ti 16GB

NVIDIA **$800**

Nvidia's RTX 50-series cards have been hard to find for good prices, but this one's widely available, punchy and affordable.

COOLER

Peerless Assassin 120 SE

Thermaltake **$55**

It's a big beast, but it brings cooling performance to the table that's undeniably impressive.

MEMORY

XPower Storm RGB DDR5 6000MT/s

Silicon Power **$165**

A sleek RGB DDR5 kit that gives solid performance for the price, running at 6000MT/s, which is perfect for the CPU in this build.

POWER SUPPLY

Pure Power 12 M 750W

Be Quiet! **$179**

This larger Be Quiet! PSU offers a stable platform with PCIe 5.0 connectivity. At 750W, there's room for a GPU upgrade too.

SSD

NM790 1TB

Lexar **$119**

The Lexar proves you can, sometimes, have it all: blazing speeds, cool operation and a great price.

CASE

H7

Nzxt **$179**

It's very clever of Nzxt to design such an easy PC case to build into, and make it look so gorgeous too.

DISPLAY

MPG 275CQRXF

MSI **$479**

The price of this MSI, considering the 1440p resolution, curve and 240Hz refresh rate, is quite something.

KEYBOARD

K855 Wireless TKL

Logitech **$119**

You could spend more for a full-size keyboard, but this mechanical Logitech will certainly suffice for most people.

MOUSE

DeathAdder V2 X Hyperspeed

Razer **$59**

The regular V2 is great if you can find one, but this version delivers impeccable gaming performance for less.

HEADSET

Cloud Alpha

HyperX **$140**

We're still not over the awesome audio quality and excellent comfort of the HyperX Cloud Alpha.

MOUSE PAD

G440

Logitech **$27**

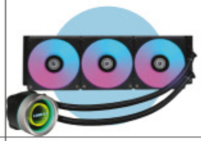
This low-friction hard-top mouse pad with minimal branding offers the smoothest of glides for a reasonable price.

ADVANCED BUILD

Go above and beyond with a PC powerful enough to tackle anything.

TOTAL

$8,917

MOTHERBOARD		**MAG X870E Tomahawk** MSU $569 With support for four M.2 drives, huge amounts of DDR5, Wi-Fi 7 and more, this mega mobo is specced to the hilt.
PROCESSOR		**Ryzen 7 9800X3D** AMD $889 The top-tier Zen 5 X3D models will have more cores, but for gaming and most uses this is the bee's knees.
GRAPHICS CARD		**GeForce RTX 5080** Nvidia $2,500 The RTX 5090 is ridiculously expensive, so we're recommending the RTX 5080 instead, but if you can afford a 5090 go for it.
COOLER		**Galahad II Trinity 360** Lian Li $249 Lian Li's Galahad is all about pure liquid cooling performance and it delivers this flawlessly.
MEMORY		**Trident Z5 RGB (2x16GB) 6000MT/s** G.Skill $159 This is a new memory standard for a new era of memory speed. DDR5 is blisteringly and fantastically quick.
POWER SUPPLY		**Prime PX-1300** Seasonic $499 This PC is a thirsty beast, so you'd better give it a serious power supply – and this one's similarly monstrous.
BOOT DRIVE		**NM790 4 TB** Lexar $368 With 4TB of storage, it's going to take one seriously big Steam library to get anywhere close to filling this drive up.
MOUSE PAD		**Firefly V2 Pro** Razer $169 Do you need an RGB mouse mat? If it makes you feel any better it's excellent for flick shots.
CASE		**5000D** Corsair $189 We swear this stylish mid-tower is bigger on the inside. It's the PC equivalent of the TARDIS.
DISPLAY		**ROG Swift OLED PG32UCDM** Asus $2,229 You could be much more sensible on your screen than this. For this build, however, we only want the best.
KEYBOARD		**Corsair Vanguard Pro 96** Corsair $349 An outstanding typing experience, and packed with features that would make even the most exacting gamer happy.
MOUSE		**DeathAdder V4 Pro** Razer $299 The latest version of the DeathAdder isn't cheap, but when it comes to performance it's sensational.
HEADSET		**Maxwell** Audeze $499 Planar magnetic drivers make this headset pure heaven for audio fans. And everyone else, to be honest.

WORKSHOPS & TIPS

Easy-to-follow workshops and expert tips

WORKSHOPS IN THIS ISSUE

90 Tidy your messy desktop with Fences

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97 Make Office Better

98 Master notifications on Mac

100 Edit messages you send from Android to iPhone

Tidy your messy desktop with Fences.

Tame the constant interruptions.

IT WILL TAKE
30 minutes

YOU'LL NEED
Fences 6

Everyone knows how tough it can be to focus on an important job when you have a lot on your mind. It can be even worse when you're trying to focus in an untidy, cluttered environment. It's not because we're weak-willed, either: it's a scientific fact.

In a 2011 study (**tinyurl.com/APC551focus**), researchers at Princeton University's department of psychology found that "multiple stimuli present in the visual field at the same time compete for neural representation by mutually suppressing their evoked activity throughout the visual cortex". Or, in layman's terms, with so many things competing for your attention, you don't know what to focus on first.

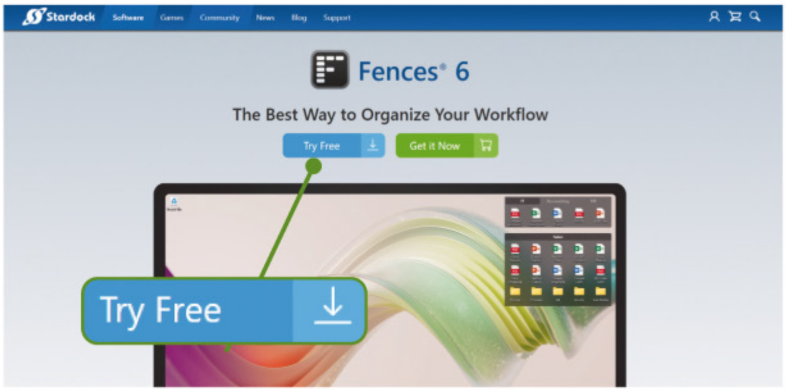
There is a counter-argument to this – that an untidy environment can actually encourage creativity (so-called 'creative chaos') and, again, studies back it up. One, published in 2013 (**tinyurl.com/APC551chaos**), found that people who spent time in a disorderly room were more creative than people who spent time in an orderly room.

Your own opinion is likely to be coloured by your personal experiences, but the fact remains that it's usually easier and quicker to find the files you need on a tidy, organised computer than it is on one where your data is scattered here, there and everywhere.

The trouble is, many modern operating systems indulge our bad habits. Gnome, the graphical environment used on many Linux distros, doesn't allow anything to be saved to the desktop, but Windows and macOS do. Many of us will save files on the desktop temporarily, fully intending to delete or reorganise them when we have time. Frequently, however, we never do have enough time, the files stay where they are, and the mess can start to snowball.

Here, we explain how to use Stardock's Fences (version 6) program to keep your desktop in good order.

Click the 'Try Free' button to use Fences on a 30-day trial.



1 START A FREE TRIAL OF FENCES

Should the desktop really be out of bounds entirely? It's such a useful space – and one that you'll see dozens of times every time you use your computer. Wouldn't it be great if you could use it to both temporarily store the files you immediately need to open, and as a hub through which you could quickly access folders and keep your most frequently used programs close at hand without pinning them to the taskbar?

That's probably what the developers of Fences – US firm Stardock – asked themselves, before going on to develop a program that does just that. To give it a try, go to **tinyurl.com/APC551fences** and click the blue Try Free button (see screenshot left). When the file has downloaded, launch 'Fences6-fs-setup.exe' from your Downloads folder, then follow the instructions. When installation has completed and Fences 6 automatically launches, click 'Start 30 Day Trial' and you can try it before spending any money.

Enter your email address and Stardock will send you a message. Click the 'Activate 30-Day Trial' button that it contains to verify that your email address is correct and active. This will switch you back to Fences and enable the software. Click Finish on the installer to complete the process.

When you clicked the link you'll have been opted into Stardock's email subscriptions for special offers, promotions and information about Fences 6. If you want to opt out of these immediately, click the Manage Email Subscriptions link on the page that will already be open in your browser and untick the three boxes on the following page. When you've done so, click Submit. After 30 days you'll need to decide whether Fences is worth paying for. We think its $18 annual subscription is superb value, as indeed is the $51.99 for a permanent licence. Those prices are for just one machine. To install on up to five, you'll need to pay $35 a year or $86.99 for a permanent licence – for details visit **tinyurl.com/APC551buyfences**.

A decent free option is Portals (**https://portals-app.com/**), though unsurprisingly it doesn't have as many features. As with Fences, it uses defined areas on your desktop as containers for folders, documents, photos and more.

HOW I KEEP MY DESKTOP TIDY

I tend not to save files to my desktop but I do have a bad habit of storing things I'm working on in the Downloads folder – purely because when I've downloaded a file and need to edit it I know where I'll find it. Unfortunately, I'm now also saving files I've created from scratch there, intending to reorganise them "when I have time". So far, that "time" has yet to arrive. Perhaps with some help from Fences I can start saving on the desktop when a file isn't ready to move to the appropriate library. That way, I can clear out my Downloads folder when it starts to bloat without risking deleting any important files.

Nik Rawlinson

2 DRAG FILES INTO FENCES' PANELS

Fences helps to keep your desktop organised by ring-fencing elements on screen. These are set up in advance so that they don't keep rearranging themselves as your desktop contents change. You'll have already come across the concept of preset areas in Windows' snap windows, where you can drag active program windows to the edges or corners of the screen. They then neatly arrange themselves into preset shapes.

Fences comes with several preset layouts, but you can create your own. The launch screen therefore asks what you'd like to do first: start using Fences with its default layouts or define your own areas from scratch. For the moment, to familiarise yourself with how it works, click 'Start using Fences' (see screenshot above right). This lets you work with the preset layouts.

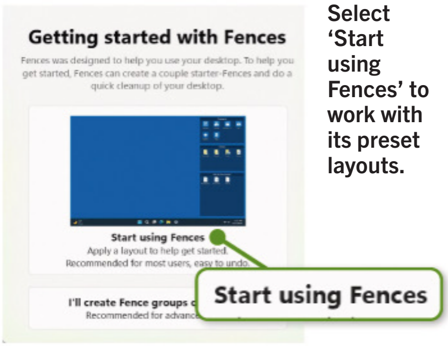
You might not immediately think things have improved. Any mess that was on your desktop is still there, and it will have been joined by floating panels for your Downloads (1 in our screenshot below left), Programs 2, Folders 3 and 'Files & Documents' 4. However, this is just your starting point. Each of these panels is a container for what you might otherwise dump on the desktop. You just need to put them to good use.

Let's start by sorting out the documents and other files you need to keep. Naturally, if any can be filed in the dedicated Windows libraries for Documents, Pictures, Videos and so on – which you'll find in the File Explorer sidebar – you should move them there. If any can be deleted, drag them to the recycle bin. Everything else, which you're still working with and want to keep close at hand, drag into the 'Files & Documents' panel.

When you drop a file here, it disappears from the cluster of icons on your desktop. So, where has it gone? The answer is quite simple: nowhere.

In our screenshot below we've dragged four images into the 'Files & Documents' area 1. By right-clicking one (IMG_9163), then clicking Properties, followed by the Details tab 2, we can scroll down to the metadata and see that the 'File location' is C:\Users\nik\Desktop 3. So, the file hasn't been removed from the desktop; it's just been hidden now that we've filed it appropriately.

This is important for two reasons. First, it means the file is still where we expect to find it if we open the Desktop folder in File Explorer. To verify this for



Getting started with Fences

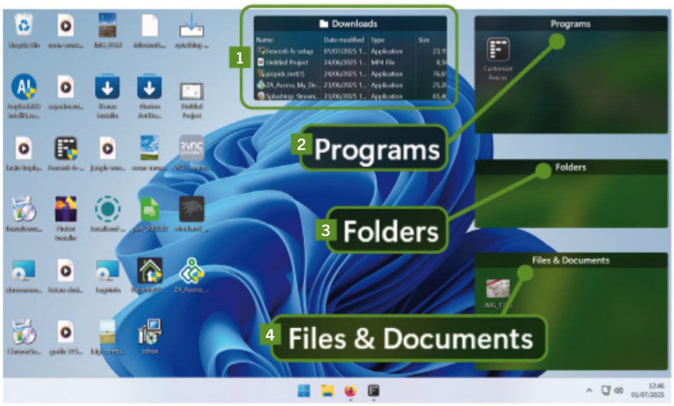
Fences was designed to help you use your desktop. To help you get started, Fences can create a couple starter-Fences and do a quick cleanup of your desktop.

Start using Fences
Apply a layout to help get started.
Recommended for most users, easy to undo.

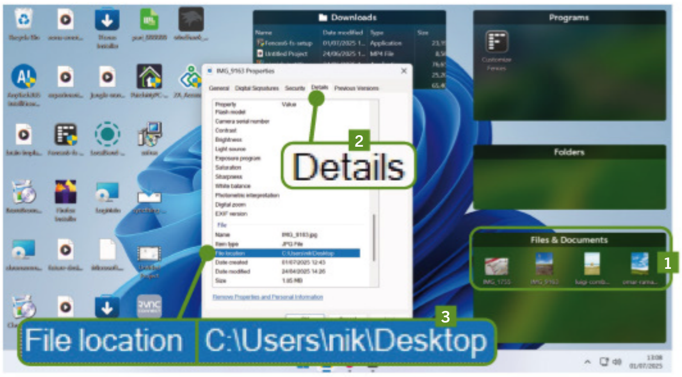
I'll create Fence groups c
Recommended for advance

Select 'Start using Fences' to work with its preset layouts.

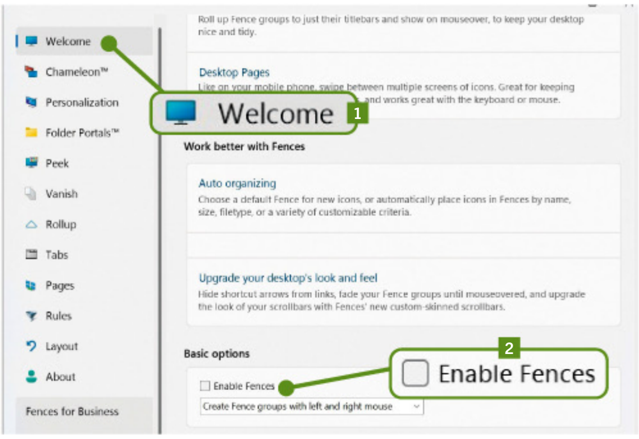
> "Fences helps to keep your desktop organised by ring-fencing elements on screen. These are set up in advance so that they don't keep rearranging themselves as your desktop contents change."



Fences adds four preset zones to your screen.



The metadata shows us that Fences has hidden the file, but it's still on our desktop.



Roll up Fence groups to just their titlebars and show on mouseover, to keep your desktop nice and tidy.

Desktop Pages

Like on your mobile phone, swipe between multiple screens of icons. Great for keeping … and works great with the keyboard or mouse.

Work better with Fences

Auto organizing

Choose a default Fence for new icons, or automatically place icons in Fences by name, size, filetype, or a variety of customizable criteria.

Upgrade your desktop's look and feel

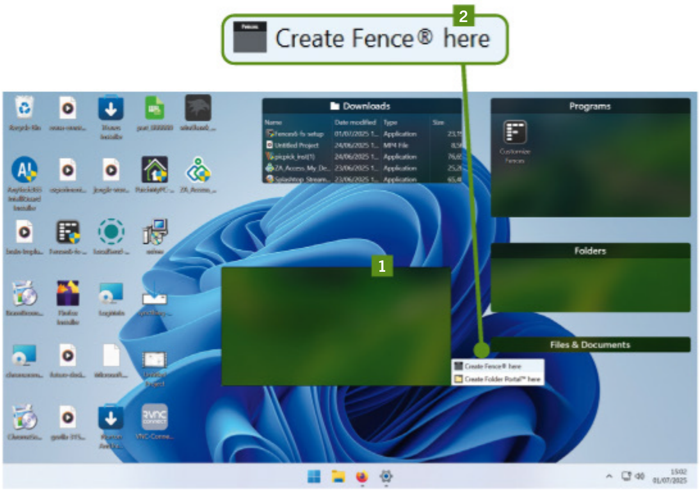
Hide shortcut arrows from links, fade your Fence groups until mouseovered, and upgrade the look of your scrollbars with Fences' new custom-skinned scrollbars.

Basic options

☐ Enable Fences

Create Fence groups with left and right mouse

Untick this box and Fences will be disabled, returning your files to your desktop.



You can create your own fences by dragging out a rectangle on the desktop.

yourself, open File Explorer, click Desktop in the sidebar and look for your file. It will be there, even though it's not actually visible on your desktop. Second, it means that should you ever uninstall Fences your files will still be where you expect to find them. Any that have been hidden should reappear.

If you want to check this, right-click anywhere on the desktop (not in File Explorer's Desktop folder) followed by Configure Fences. Now, with Welcome selected in the sidebar (1 in our screenshot above), scroll down to the bottom of the main pane and untick Enable Fences 2. Immediately, the preset panels will disappear and the files you dragged into them will be reinstated on your desktop. To set Fences running again simply re-tick the box.

3 CREATE YOUR OWN CUSTOM PANELS

The panels for Programs and Folders let you quickly go to the software and locations you use most often, without going via the Start menu or digging through File Explorer. The Downloads folder shows your recent downloads, though you won't be able to change their order by clicking the headings at the top.

These default fences are well thought out to get you started and will suit most users. However, to add more just click and hold on the desktop, then drag out a rectangle (1 in our screenshot above right). When you let go of your mouse or trackpad button, click 'Create Fence here' in the menu that appears 2.

> "Fences has some clever hidden features that won't be immediately obvious, but can help you make best use of your screen space."

4 MASTER FENCES' HIDDEN FEATURES

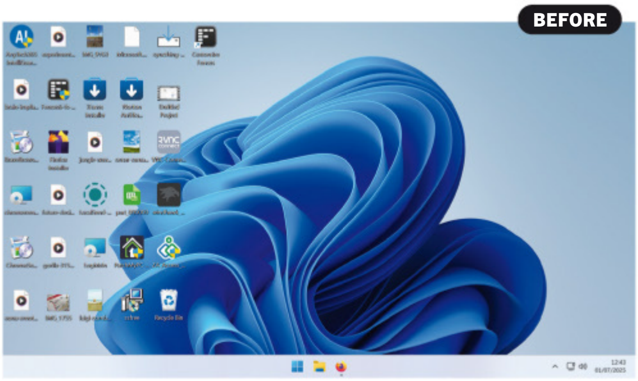
Fences has some clever hidden features that won't be immediately obvious, but can help you make best use of your screen space. For example, double-click any blank area in the title bar of a fenced-off section and it will roll up into itself to reveal the desktop below. Or, drag one fenced area on top of another to combine them. They will then be stacked, and you can switch between them by clicking the tabs for each in the title bar.

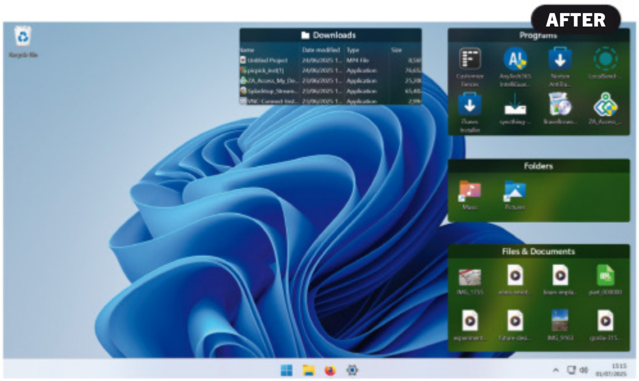
To quickly hide everything, double-click any blank area on your desktop, and the icons, folders and programs stored there – along with the panels managed by Fences – will disappear. Double-click again to get them back.

You can also quickly reveal your fences, but not the desktop, by pressing Windows key+Space. When you do this, the panels will pop up and sit on top of your active program without you having to minimise the window in which you're working. ■

THE END RESULT

Look at the before and after images below that show a messy Windows desktop before we installed Fences, and a far more organised environment with Fences active.





What's the fuss about...

Adaptive Energy Saver

You can't take a dim view of Microsoft's new tool for boosting battery life.

What is it?

A new tool in Windows 11 that prolongs your laptop's battery life without dimming the screen. This makes it better than the current Energy Saver in Windows (build 24H2), which isn't adaptive and so is a much cruder tool.

Can you explain what adaptive means?

Yes. In technology, it describes a feature that automatically adapts to changing conditions and works differently to cope with them, without you having to alter any settings. It's also sometimes called 'dynamic', such as 'high dynamic range' in TVs that changes brightness and contrast scene by scene.

And what kind of changing conditions would affect my laptop's power?

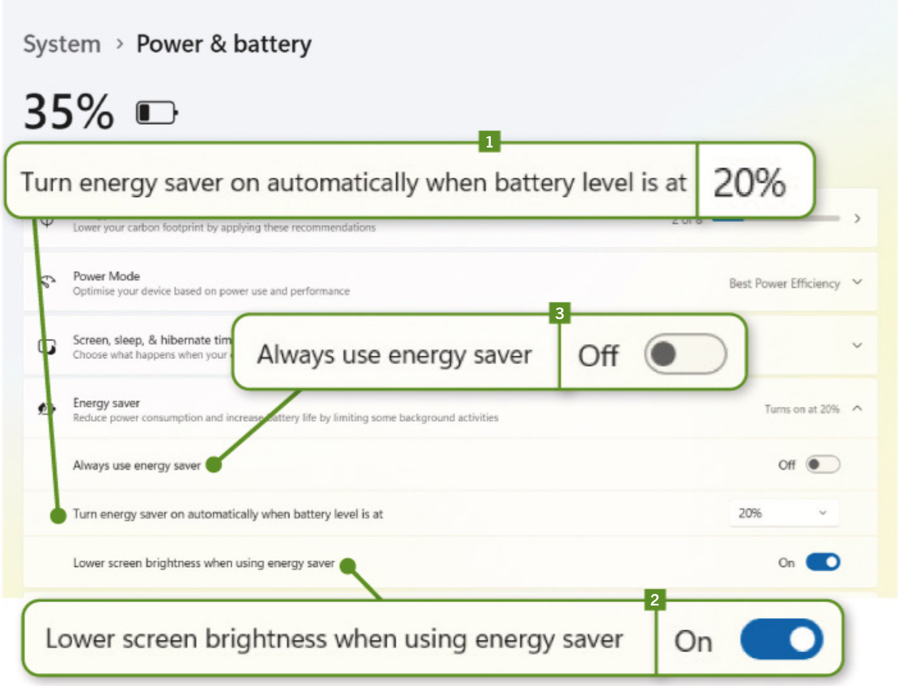
It depends on how hard your processor and graphics card are working on different tasks. For example, if you're browsing the web or writing emails, your laptop doesn't need full processing power, so Adaptive Energy Saver scales back power to the processor and graphics card to save battery. But if you start playing a game or editing videos it automatically increases power again to boost your performance. Once you've enabled Adaptive Energy Saver it'll work in the background. You don't need to turn on any other settings.

But you do if you're using the existing Energy Saver?

Yes. You'll find this by opening Settings (press Windows key+I), then clicking System followed by 'Power & battery' and opening the 'Energy saver' menu. You can then set a battery percentage at which Energy Saver will kick in (1 in our screenshot right – it's 20 per cent by default).

And what happens then?

It depends whether you've turned on the 'Lower screen brightness when using energy saver' slider 2. If so, Windows will dim your screen to preserve battery. You can see how dark this goes by also turning on the 'Always use energy saver' slider 3. It will also cut resources being used by your laptop.



System › Power & battery

35%

1 Turn energy saver on automatically when battery level is at 20%

Lower your carbon footprint by applying these recommendations

Power Mode
Optimise your device based on power use and performance
Best Power Efficiency

Screen, sleep, & hibernate tim
Choose what happens when your

3 Always use energy saver Off

Energy saver
Reduce power consumption and increase battery life by limiting some background activities
Turns on at 20%

Always use energy saver Off

Turn energy saver on automatically when battery level is at 20%

Lower screen brightness when using energy saver On

2 Lower screen brightness when using energy saver On

You can control your laptop's power use in Energy Saver, but it's a crude tool.

> "If you're browsing the web or writing emails, your laptop doesn't need full processing power, so Adaptive Energy Saver scales back power to the processor and graphics card to save battery. But if you start playing a game or editing videos it automatically increases power again to boost your performance."

What if you don't lower screen brightness?

Then Energy Saver will still aim to prolong your laptop's battery but only by reducing its resources, not by dimming its screen. This saves more battery life than dimming only. These controls are useful, but they're rather blunt – either on or off. Adaptive Energy Saver is more sophisticated, controlling your power in the background to maximise battery life. You don't need to set a battery percentage level for it to start working. Once you've turned it on, it'll work continuously.

Can I use Adaptive Energy Saver now?

Only if you're a Windows Insider on the Canary channel, which is the earliest preview build of the operating system, where Microsoft tests its most experimental features. It was part of build 27898, released on 11 July, along with other tools like adding your own words to the Voice Access dictionary . You'll find it in the 'Power & battery' section of Settings mentioned above. We can't see any reason why it won't be added to the full version of Windows soon.

Does it use AI to work?

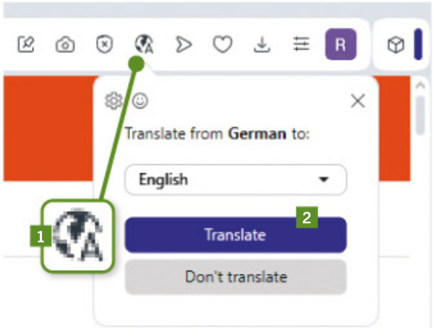
No, though it responds intelligently to changing conditions just as some AI tools do. But it does this by analysing what you're doing on your laptop, not using complex AI algorithms or machine-learning software.

So why has it taken Microsoft so long to add it to Windows?

Because the operating system runs on a wide variety of machines with countless different hardware and drivers. It's been hard to find a way to control laptop power across all these setups without causing problems. There's nothing adaptive or dynamic about a crashed laptop. ■

Browser tips

Secret settings and best extensions.


Translate from German to:
English
1
2
Translate
Don't translate

OPERA

Translate foreign-language web pages

Opera 120, released at the beginning of July, adds a feature you may have assumed it already had: built-in translation. Previously, if you wanted to translate foreign-language web pages in the browser you needed to install an add-on such as Google Translate.

When Opera detects foreign-language content, it should now automatically offer to translate the page into English. You can also translate manually by clicking the new Translate icon on the toolbar (1 in our screenshot below) then the purple Translate button 2.

Opera can translate more than 40 languages into English, including German, French, Spanish, Greek and Chinese. It currently only translates entire pages, not specific sections of text you select.

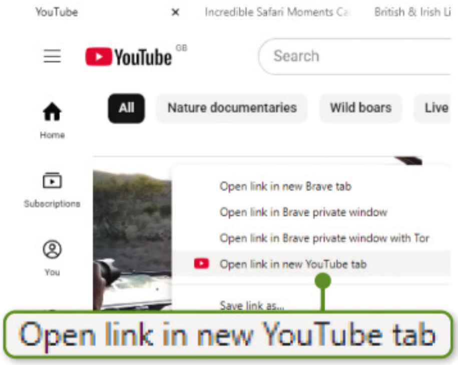
BRAVE

Open PWAs in tabbed windows

Brave has added the useful option to open progressive web apps (PWAs) in tabbed windows. This lets you switch between multiple pages of a website you've installed as a PWA, like you do with sites in the main browser. So, for example, you can play YouTube videos in new tabs without navigating away from your search results.

To open a PWA in a tabbed window, right-click it on Brave's Apps page (brave://apps) and choose 'App settings'. Select 'Open in tabbed window' and when you next click the app, it will open with tabs. Right-click a link within the PWA and choose 'Open link in new [PWA name] tab' (see screenshot below left).

Other sites that support PWAs include Google Drive, Outlook and Proton Mail. Click the Install button in Brave's address bar to install them as apps.


YouTube
Incredible Safari Moments C
British & Irish Li
YouTube GB
Search
Home
Subscriptions
You
All
Nature documentaries
Wild boars
Live
Open link in new Brave tab
Open link in Brave private window
Open link in Brave private window with Tor
Open link in new YouTube tab
Save link as...
Open link in new YouTube tab

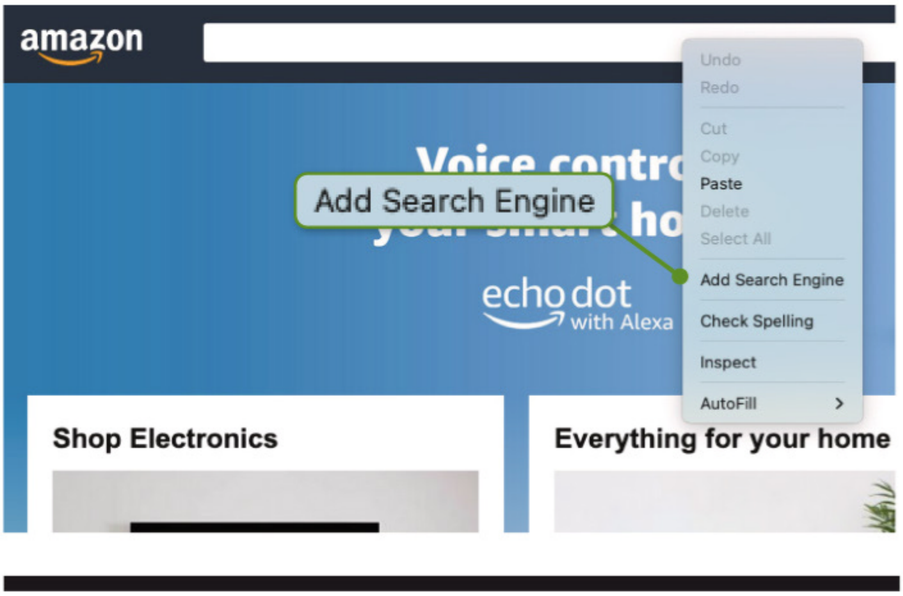
Firefox

Add more search engines to Firefox

Firefox 140, released at the end of June, lets you expand the browser's selection of search engines. The five built-in options are Google, Bing, DuckDuckGo, eBay and Wikipedia, but you can now add any website that has its own search tool.

To add a search engine, such as Amazon, YouTube or the AI-powered Perplexity, simply right-click its search box and choose Add Search Engine (see screenshot below). Enter its name and optionally specify a keyword shortcut. This will let you search the site by typing @ then the keyword into Firefox's address bar – for example @amazon. Click 'Add Engine' to save the search engine to the browser.

To change your default search engine, click the browser's three-line menu button and choose Settings then Search. Scroll down to Search Shortcuts to see the full list of search engines and their respective keywords.

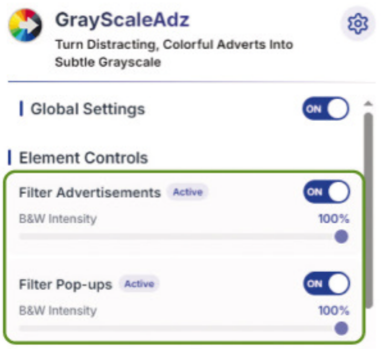

amazon
Undo
Redo
Cut
Copy
Paste
Delete
Select All
Add Search Engine
Check Spelling
Inspect
AutoFill
Add Search Engine
Voice contr
your smart ho
echo dot with Alexa
Shop Electronics
Everything for your home

CHROMIUM

Make ads less distracting

A new extension called GrayscaleAdz (**tinyurl.com/APC551gray**) makes adverts on web pages less annoying without blocking them. It turns colourful, distracting ads black and white so you can focus on the main content.

The extension also applies its greyscale filter to pop-ups and ads in YouTube videos. You can customise its intensity by clicking its toolbar button and adjusting the B&W Intensity sliders (see screenshot above), and whitelist sites to preserve their ad colour.

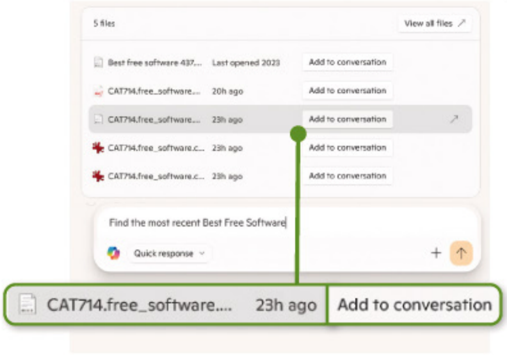

GrayScaleAdz
Turn Distracting, Colorful Adverts Into Subtle Grayscale
Global Settings
ON
Element Controls
Filter Advertisements
Active
ON
B&W Intensity
100%
Filter Pop-ups
Active
ON
B&W Intensity
100%

GrayscaleAdz is an interesting idea, and means sites aren't deprived of essential advertising revenue, but it doesn't always work. On Mail Online, for example, it made the whole homepage monochrome. ■

AI tips

Expert tips for a better experience.

NEW IN apc



5 files
View all files

Best free software 437...	Last opened 2023	Add to conversation
CAT714.free_software...	20h ago	Add to conversation
CAT714.free_software...	23h ago	Add to conversation
CAT714.free_software.c...	23h ago	Add to conversation
CAT714.free_software.c...	23h ago	Add to conversation

Find the most recent Best Free Software

Quick response
CAT714.free_software.... 23h ago
Add to conversation

COPILOT

Find and analyse files on your PC

The Copilot app for Windows 10 and 11 can now search for files stored on your PC, saving you having to use the standard Windows Search tool. You can add files it finds to your chats and ask Copilot questions about them.

To activate this handy new feature, click the Account icon in the bottom-left corner of the Copilot app and choose Settings. Switch on the options 'File search' and 'File read'.

Ask Copilot to find a file and it will display a list of matching results. Click 'Add to conversation' (see screenshot above) to add a file to your chat, ask questions about its content and get Copilot to edit the text.

Copilot can find files in most formats and 'read' documents in DOCX, XLSX, TXT and PDF format. Double-click a result to open that file in its default program.

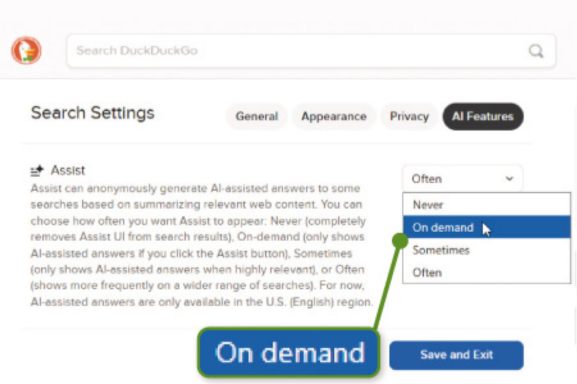
DUCKDUCKGO

Control the AI answers in your search results

Like Google, DuckDuckGo now includes AI-generated answers in its search results through its Assist feature. Unlike Google, it lets you control how often you see them – or disable Assist altogether.

On the DuckDuckGo website, click the three-line menu button in the top-right corner and choose Settings, then AI Features. Click the dropdown menu next to Assist and select Sometimes, Often or Never to specify how frequently AI-assisted answers appear. Choose 'On demand' (see screenshot below) to only reveal them when you click the Assist button below the search box. Click 'Save and exit' to confirm.

You can apply the same setting to Assist in DuckDuckGo's app for Android (**tinyurl.com/APC551duck**) and iOS (**tinyurl.com/APC551duckio**).



Search DuckDuckGo

Search Settings

General
Appearance
Privacy
AI Features

Assist

Assist can anonymously generate AI-assisted answers to some searches based on summarizing relevant web content. You can choose how often you want Assist to appear: Never (completely removes Assist UI from search results), On-demand (only shows AI-assisted answers if you click the Assist button), Sometimes (only shows AI-assisted answers when highly relevant), or Often (shows more frequently on a wider range of searches). For now, AI-assisted answers are only available in the U.S. (English) region.

Often
Never
On demand
Sometimes
Often
On demand
Save and Exit

ChatGPT

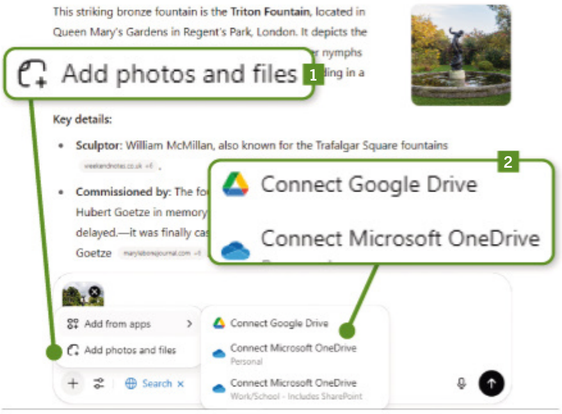
Search the web using an image

ChatGPT has added the option to search the web using images – commonly referred to as a reverse-image search. This differs from its standard image-analysis feature, which merely describes the content of a picture.

With the new option, you don't even need to type a prompt. Just click the Tools button below the message box, select 'Search the web' then click the plus-sign button and choose 'Add photos and files' (1 in our screenshot).

Upload an image from your computer and ChatGPT will search the web for information about its subject, and cite its sources so you can visit those sites for further details. It can also find different shots of the same subject.

ChatGPT can now be connected with Google Drive and OneDrive, so you can add photos and other files from those services. Click 'Add from apps' and choose 'Connect Google Drive' or 'Connect Microsoft OneDrive' 2.



This striking bronze fountain is the **Triton Fountain**, located in Queen Mary's Gardens in Regent's Park, London. It depicts the

Key details:

- **Sculptor:** William McMillan, also known for the Trafalgar Square fountains
- **Commissioned by:** The fo
  Hubert Goetze in memory
  delayed.—it was finally ca
  Goetze

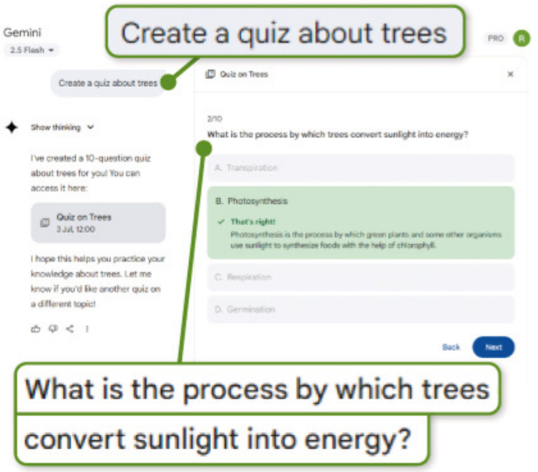
Add photos and files
1
2
Connect Google Drive
Connect Microsoft OneDrive
Add from apps
Add photos and files
Search
Connect Google Drive
Connect Microsoft OneDrive
Personal
Connect Microsoft OneDrive
Work/School - Includes SharePoint

GEMINI

Generate interactive quizzes

Gemini has introduced an interesting feature that generates custom quizzes on any topic you can think of. Previously, it could suggest questions for a quiz, but the new option goes further by creating interactive quizzes, complete with hints and explanations for right and wrong answers.

Google says the feature can help students prepare for exams, but it's equally useful for testing your knowledge of a given subject. Just tell Gemini the topic (see screenshot above) and it will generate a 10-question, multiple choice quiz you can take on its website or in its mobile apps. ■



Create a quiz about trees

I've created a 10-question quiz about trees for you! You can access it here:

Quiz on Trees
3 Jul, 12:00

I hope this helps you practice your knowledge about trees. Let me know if you'd like another quiz on a different topic!

Quiz on Trees

2/10

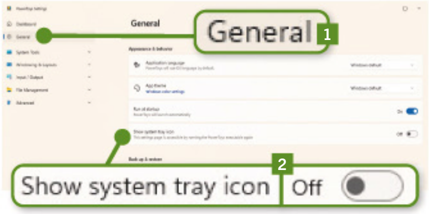
What is the process by which trees convert sunlight into energy?

A. Transpiration
B. Photosynthesis
✓ That's right!
Photosynthesis is the process by which green plants and some other organisms use sunlight to synthesize foods with the help of chlorophyll.
C. Respiration
D. Germination

Gemini
2.5 Flash
Create a quiz about trees
PRO
Show thinking
Back
Next
What is the process by which trees convert sunlight into energy?

Make Windows better

Expert tips for a better experience.


General 1
2
Show system tray icon
Off

WINDOWS 10 & 11

Hide PowerToys' system-tray icon

When you launch PowerToys it places an icon in your system tray. Version 0.92, released in early July, lets you remove this icon. Open PowerToys then click General at the top left (1 in our screenshot below). Now, on the right, scroll down to the 'Appearance & behavior' section and turn off the 'Show system tray icon' slider 2.

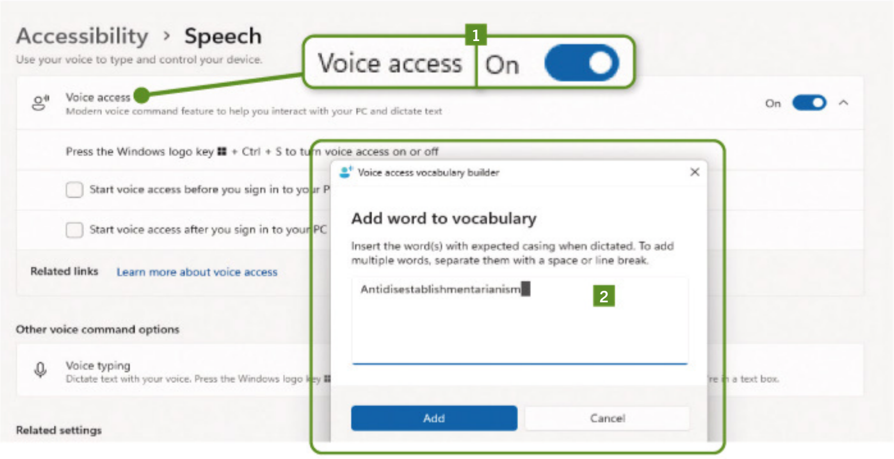
WINDOWS 11 insider

Add your own words to Voice Access

If you use Windows 11's Voice Access to control your PC with your voice, you can now teach it words it doesn't recognise, like your name, address or favourite software – though you'll need to be running Windows 11 Preview build 26120.

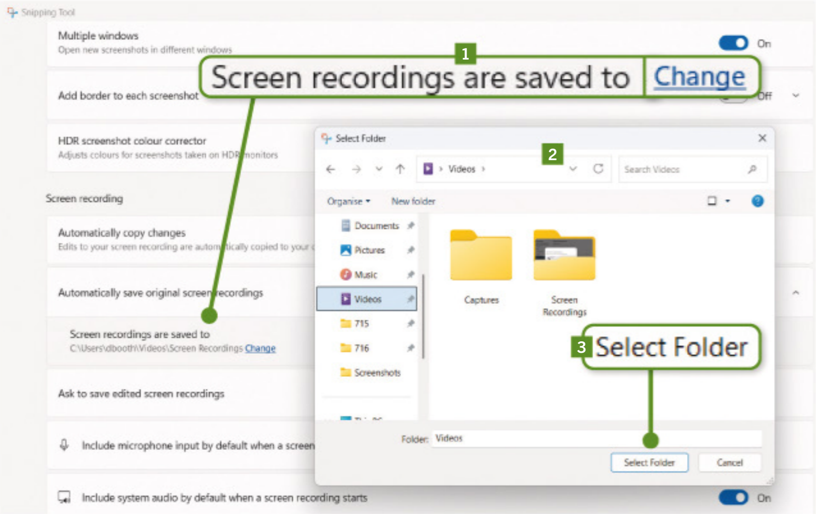
First, press Windows key+I to open Settings, then click Accessibility followed by Speech, and make sure the Voice Access slider is on (1 in our screenshot below). You can also turn Voice Access on and off by pressing Windows key+Ctrl+S.

Now activate your microphone and say "add to vocabulary". A box will appear where you can type the word you want it to recognise 2. Click Add to confirm. You can also click the Settings cog top right then select 'Add to vocabulary' and type your word.


Accessibility › Speech
Use your voice to type and control your device.
Voice access
Modern voice command feature to help you interact with your PC and dictate text
On
1
Voice access
On
Press the Windows logo key + Ctrl + S to turn voice access on or off
☐ Start voice access before you sign in to your PC
☐ Start voice access after you sign in to your PC
Related links
Learn more about voice access
Other voice command options
Voice typing
Dictate text with your voice. Press the Windows logo key
Related settings
Voice access vocabulary builder
Add word to vocabulary
Insert the word(s) with expected casing when dictated. To add multiple words, separate them with a space or line break.
Antidisestablishmentarianism
2
Add
Cancel

Windows 11

Choose where screen recordings are saved to


Snipping Tool
Multiple windows
Open new screenshots in different windows
On
1
Screen recordings are saved to
Change
Add border to each screenshot
Off
HDR screenshot colour corrector
Adjusts colours for screenshots taken on HDR monitors
Screen recording
Automatically copy changes
Automatically save original screen recordings
Screen recordings are saved to
C:\Users\dbooth\Videos\Screen Recordings Change
Ask to save edited screen recordings
Include microphone input by default when a screen
Include system audio by default when a screen recording starts
On
Select Folder
2
Videos
Search Videos
Organise
New folder
Documents
Pictures
Music
Videos
715
716
Screenshots
Captures
Screen Recordings
3
Select Folder
Folder: Videos
Select Folder
Cancel

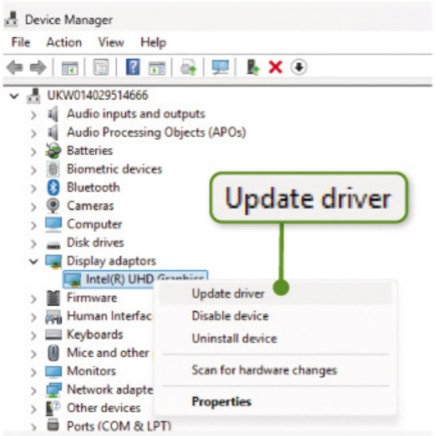
By default, screen recordings captured by Snipping Tool are saved in the folder C:\Users\username\Videos\Screen Recordings. You can change this to another folder in Snipping Tool's settings.

Search for, then open Snipping Tool then click the three dots top right followed by Settings. Scroll down to the 'Screen recording' section and click 'Change' under 'Screen recordings are saved to' (1 in our screenshot) and navigate to the folder you want to save them to 2. Click 'Select Folder' 3 to confirm.

WINDOWS 10 & 11

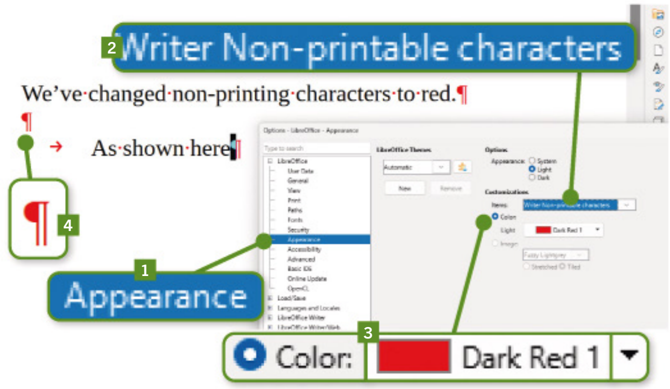
Restart your graphics driver to fix problems

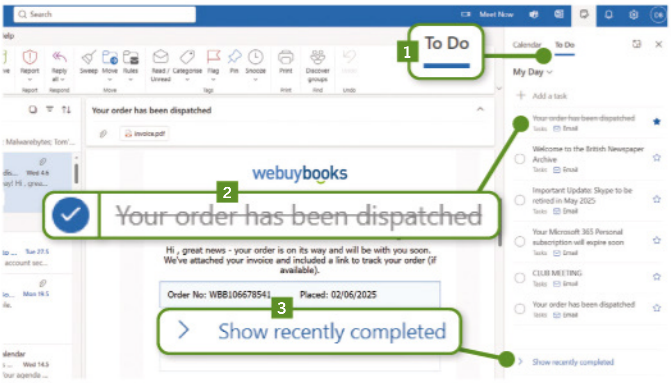
If your screen repeatedly flickers or goes black, or your graphics constantly freeze, try restarting your graphics driver without having to reboot your PC. Press Windows key+Ctrl+Shift+B. Your screen will briefly flicker, then recover. You should hear a beep too. However, this shortcut is a fast, low-impact fix, not a permanent solution. If problems persist you might need to update or reinstall your graphics drivers. To do this, type and open Device Manager then click 'Display adaptors' followed by 'Update driver' (see screenshot below). You can also look for an update on the manufacturer's website. ■


Device Manager
File
Action
View
Help
UKW014029514666
Audio inputs and outputs
Audio Processing Objects (APOs)
Batteries
Biometric devices
Bluetooth
Cameras
Computer
Disk drives
Display adaptors
Intel(R) UHD Graphics
Firmware
Human Interfac
Keyboards
Mice and other
Monitors
Network adapte
Other devices
Ports (COM & LPT)
Update driver
Disable device
Uninstall device
Scan for hardware changes
Properties
Update driver

Make Office better

Expert tips for a better experience.


2 Writer Non-printable characters
We've·changed·non-printing·characters·to·red.¶
¶
→ As·shown·here¶
¶ 4
1 Appearance
3 Color: Dark Red 1



LIBREOFFICE WRITER

Change the colour of non-printing characters

LibreOffice 25.2, released in February, lets you change the colour of non-printing characters in Writer documents. These are formatting characters like a dot to denote a space; pilcrow (¶) to mark a new paragraph; and → to indicate where you've pressed the Tab key.

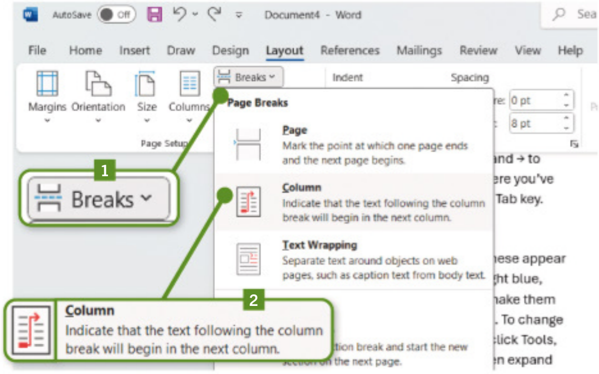
By default these appear as grey or light blue, which can make them hard to spot. To change the colour, click Tools, Options, then expand LibreOffice on the left. Now click Appearance (1 in our screenshot above) and in the Items dropdown menu choose 'Writer Non-printable characters' 2. Now pick a colour in the dropdown menu 3 and click OK at the bottom. We chose 'Dark Red 1', and our characters changed colour accordingly 4.

MICROSOFT WORD

Add column breaks to keep your documents neat

When working with multi-column documents like newsletters, brochures and flyers it's important to control exactly where your text and images flow between columns. You can do this by inserting column breaks. They move everything after the break to the top of the next column. This prevents awkward gaps from ruining the flow, and stops headings and images from being stranded at the bottom of a column.

Place your cursor at the start of the line where you want the break. Now click the Layout tab at the top, then open the Breaks menu (1 in our screenshot below) and select Column 2. If you want to see where breaks are in your document, click the pilcrow (¶) Show/Hide button in the Home tab's Paragraph section.



Column: Indicate that the text following the column break will begin in the next column.

MICROSOFT OUTLOOK.COM

Drag and drop emails so they become tasks

In Outlook you can turn emails into tasks, which are like digital reminders for actions you need to complete – such as paying a bill or confirming a booking. In the desktop versions of Outlook the fastest way to do this is by dragging the email on to the Tasks icon on the left (this is a tick inside a clipboard).

However, in Outlook.com this icon is placed at the top right and it's called My Day. Click it to open the right-hand panel then select To Do. Now drag and drop an email you want to turn into a task into this panel. You'll see options to add it as an event or a task – choose the latter.

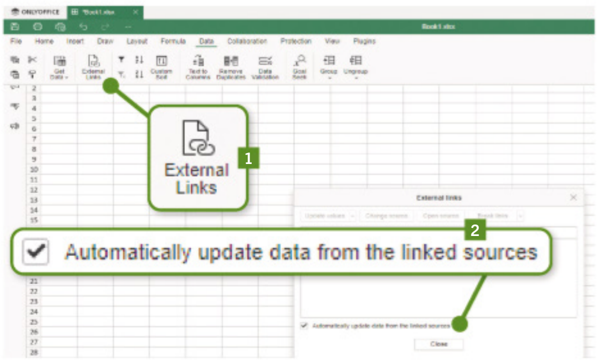
All your tasks will be listed under the To Do heading (1 in our screenshot above). Tick ones you've completed and they'll appear momentarily crossed out 2 before disappearing. There's a link to see recently completed tasks at the bottom 3. ■

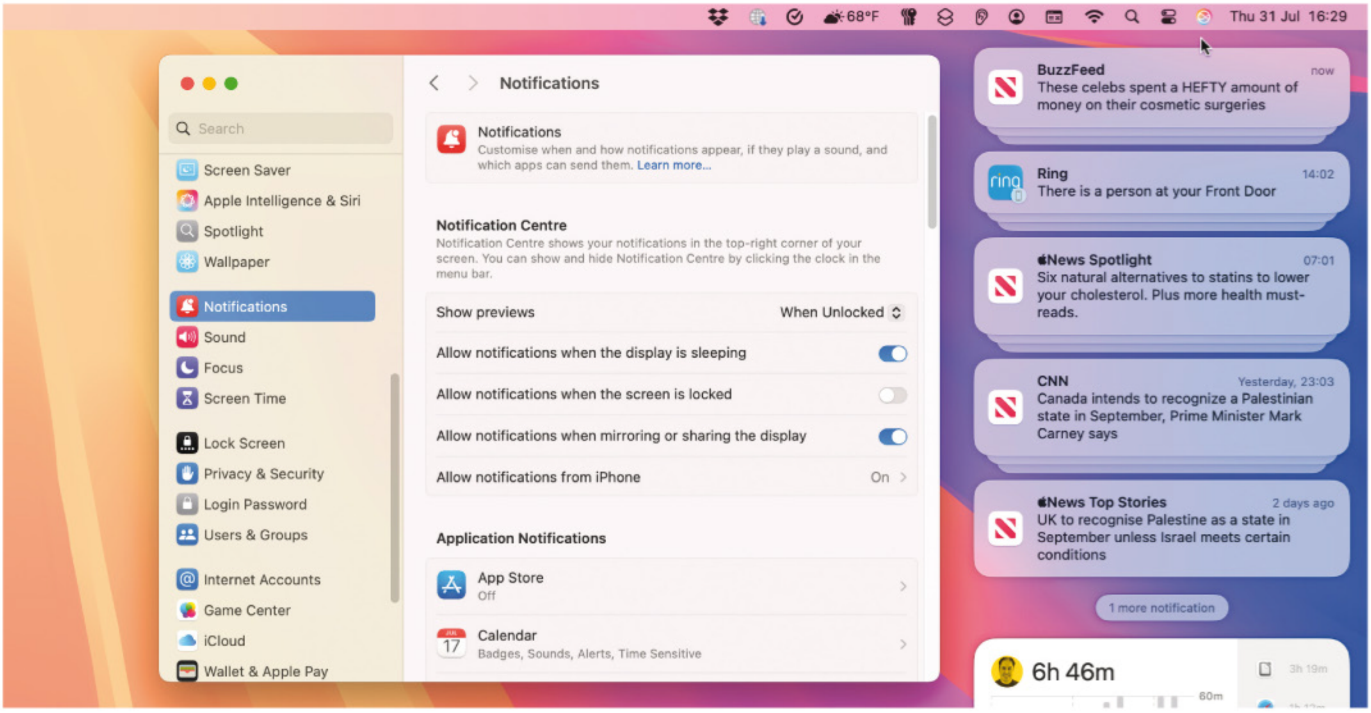
OnlyOffice

Make spreadsheets automatically update linked data

You can keep a spreadsheet relevant by manually updating the 'linked' data it shows. This is data that's pulled from other sources, such as a budget spreadsheet that gets spending details from separate files for groceries, utilities, entertainment and so on.

Rather than manually updating this data, you can set your spreadsheet to do so automatically — without you having to do anything. OnlyOffice added this option in version 8.3, released in January. Open your spreadsheet, then click the Data tab at the top followed by External Links (1 in our screenshot). Now tick 'Automatically update data from the linked sources' 2, then click Close.





Notifications

Notifications
Customise when and how notifications appear, if they play a sound, and which apps can send them. Learn more…

Notification Centre
Notification Centre shows your notifications in the top-right corner of your screen. You can show and hide Notification Centre by clicking the clock in the menu bar.

Show previews: When Unlocked
Allow notifications when the display is sleeping: On
Allow notifications when the screen is locked: Off
Allow notifications when mirroring or sharing the display: On
Allow notifications from iPhone: On

Application Notifications
App Store: Off
Calendar: Badges, Sounds, Alerts, Time Sensitive

BuzzFeed (now): These celebs spent a HEFTY amount of money on their cosmetic surgeries
Ring (14:02): There is a person at your Front Door
News Spotlight (07:01): Six natural alternatives to statins to lower your cholesterol. Plus more health must-reads.
CNN (Yesterday, 23:03): Canada intends to recognize a Palestinian state in September, Prime Minister Mark Carney says
News Top Stories (2 days ago): UK to recognise Palestine as a state in September unless Israel meets certain conditions

Master notifications on Mac

Take back control of the notifications you receive.

IT WILL TAKE
30 minutes

YOU WILL LEARN
How to get on top of notifications

YOU'LL NEED
An Apple silicon Mac with macOS 15 or later (for Apple Intelligence features)

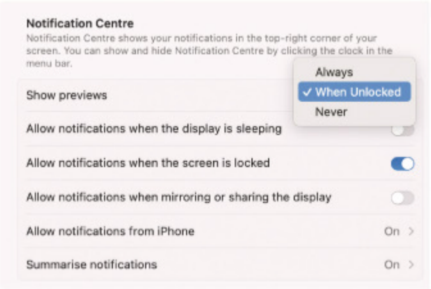
Notifications are a blessing and a curse. They can be useful in reminding you of events and letting you know what's going on, but you can receive so many they start losing their impact and quickly become annoying.

Rather than turn them all off, however, it's worth spending some time getting on top of them. You can turn off the notifications you don't want but manage and control those you do so that they work more effectively. You can even get Apple Intelligence to help you.

There are some pre-emptive measures you can take too. It's easy to visit a website and accidentally accept notifications, for example, but it's also easy to prevent this. Just launch Safari and go to Settings > Websites > Notifications then turn off 'Allow websites to ask for permission to send notifications'. Creating a Focus (System Settings > Focus) can also let you customise notifications for set time periods. You can quickly put yourself back in control.

David Crookes ■

How to Determine how your notifications appear

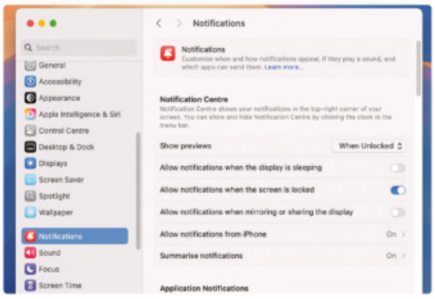


Notification Centre
Notification Centre shows your notifications in the top-right corner of your screen. You can show and hide Notification Centre by clicking the clock in the menu bar.

Show previews: Always / ✓ When Unlocked / Never
Allow notifications when the display is sleeping
Allow notifications when the screen is locked: On
Allow notifications when mirroring or sharing the display: Off
Allow notifications from iPhone: On
Summarise notifications: On

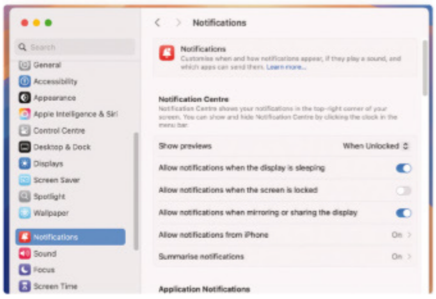
1 Get a glimpse

Go to Apple menu > System Settings > Notifications. Click the options next to Show previews and decide whether or not notifications should display a summary (Always/When Unlocked) or just display the app's name (Never).



2 Secure lock screen

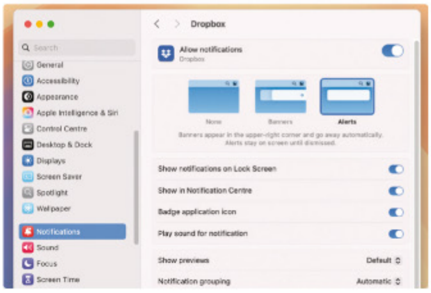
If you select When Unlocked, you'll ensure previews won't appear on a locked Mac's screen. But preview-less Notifications will still appear. To prevent this, turn off 'Allow notifications when the screen is locked'.



3 Increase security

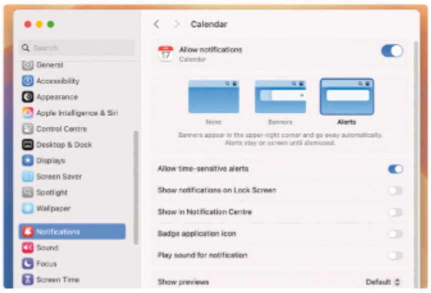
You can also use a toggle to prevent notifications appearing when a Mac is sleeping. If you turn off notifications when a Mac's display is being mirrored or shared, you can prevent accidental exposure of your alerts.

How to Manage notifications for apps and websites



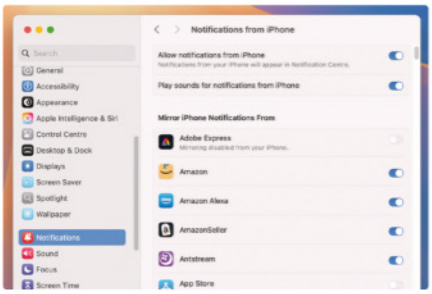
1 Manage your apps

You can customise individual app/website notifications. Select an app or site under Application Notifications and decide if you want alerts and how they should appear. Alerts can play sounds or display badges on Dock icons.



2 Time-sensitive alerts

See an option to 'Allow time-sensitive alerts' or 'Allow critical alerts'? Activate it so important notifications still appear. Have you set up a Focus (which can silence notifications)? Be sure to turn on 'Time-sensitive notifications'.

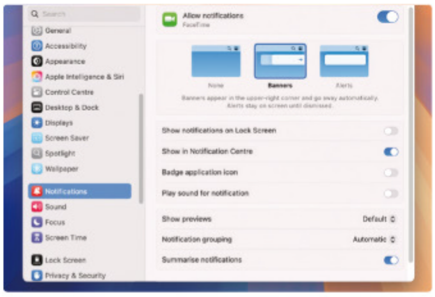


3 Mirror iPhone notifications

If you use the iPhone Mirroring app, then your Mac will start receiving your iPhone notifications. Click 'Allow notifications from iPhone' to turn this off or to determine which notifications you want.

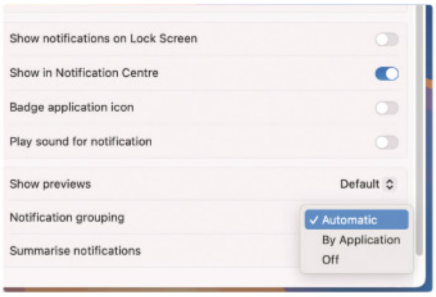
> "You can turn off the notifications you don't want but manage and control those you do so that they work more effectively. You can even get Apple Intelligence to help you."

How to Customise the Notification Centre



1 Determine what appears

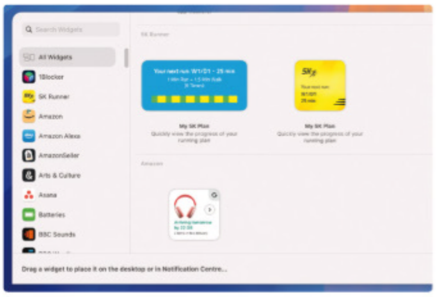
The Notification Centre is accessed by clicking the clock in the menu bar. Decide which notifications appear here by clicking the name of an app under Application Notifications and toggling Show In Notification Centre on or off.



Show notifications on Lock Screen
Show in Notification Centre
Badge application icon
Play sound for notification
Show previews: Default
Notification grouping: ✓ Automatic / By Application / Off
Summarise notifications

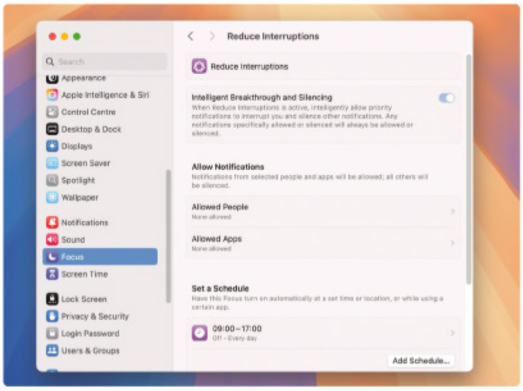
2 Group your notifications

To make them easier to manage, notifications can be grouped to appear as a series of single, collapsed entries. Choose Automatic and organise them by app, thread or topic or By Application to only organise them by app.



3 Edit widgets

It's worth mentioning that you can customise widgets in the Notification Centre. Launch it, click Edit Widgets and search. Drag those you like the look of to the Notification Centre. Click '–' next to a widget to remove it.



Use Apple Intelligence

Summarise notifications and reduce interruptions

Bombarded by notifications from particular apps but still want a heads-up? Go to System Settings > Notifications > Summarise Notifications. Turn on Summarise Notifications for an app and you'll reduce the number of notifications – instead seeing Apple Intelligence-powered highlights of multiple alerts. Apple Intelligence can also be used to allow only priority notifications to interrupt you. Go to System Settings > Focus > Reduce Interruptions and set a schedule. You can make exceptions by allowing alerts from certain people and apps.

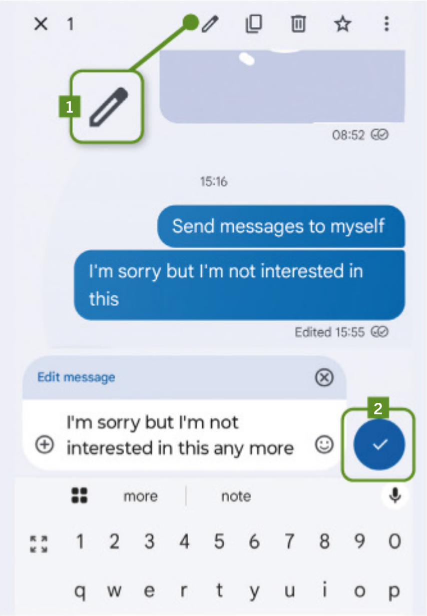
Phone & tablet tips

Brilliant things to do on your device.

ANDROID & iOS

EDIT MESSAGES YOU SEND FROM ANDROID TO IPHONE

When Apple released iOS 18 a year ago, it finally added support for RCS to its Messages app. This means Android and iPhone users can now send each other RCS messages, rather than only SMS and MMS, and enjoy the benefits of RCS technology. These include group chats, read receipts and sharing large photos and videos without being charged by your mobile network.


× 1
1
08:52
15:16
2
more
note
1 2 3 4 5 6 7 8 9 0
q w e r t y u i o p

Send messages to myself

I'm sorry but I'm not interested in this

Edited 15:55

Edit message

I'm sorry but I'm not interested in this any more

A handy new feature in the Google Messages app for Android (**tinyurl.com/APC551rcs**) lets you edit the messages you send to iPhone-owning friends and family, as you already can to other Android users. Long-press the message and tap the Edit (pencil) button in the top toolbar (1 in our screenshot below left). Amend the text as necessary, then tap the blue tick button 2 to save the updated message. You have up to 15 minutes after sending to make your changes.

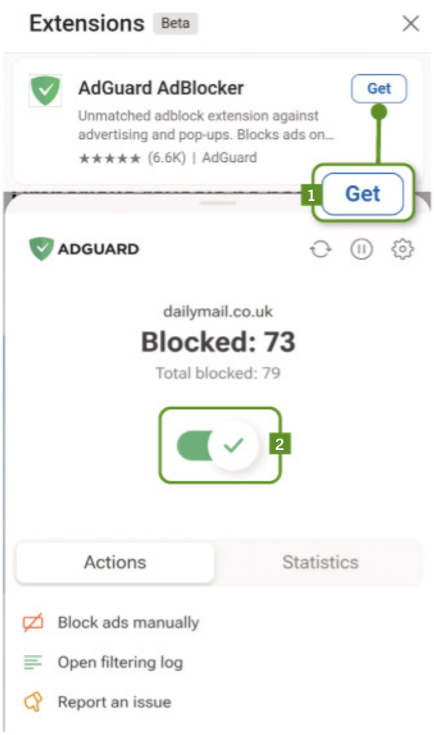
To receive your RCS message – and the edited version – the iPhone user must have RCS enabled in their Messages app. To do this, they should open the Settings app and tap Apps then Messages. In the Text Messaging section, tap RCS Messages and switch the option on.

Sadly, although EE, O2 and Three now support RCS on iPhones, Vodafone and many MVNOs still don't. So if you have friends on those networks, you won't be able to use the new editing feature when you send them messages.

ANDROID

BLOCK ADS IN EDGE USING ADGUARD

Blocking ads in Chrome is now more difficult than it used to be, but is not impossible. But you can easily block ads in Microsoft's Edge browser for Android (**tinyurl.com/APC551guard**) by installing the extension uBlock Origin. Now there's another option because the excellent ad-blocker AdGuard has released its own extension for Edge.


Extensions Beta
AdGuard AdBlocker
Get
★★★★★ (6.6K) | AdGuard
1
Get
ADGUARD
dailymail.co.uk
Blocked: 73
Total blocked: 79
2
Actions
Statistics
Block ads manually
Open filtering log
Report an issue

Unmatched adblock extension against advertising and pop-ups. Blocks ads on...

To install it, tap the three-line menu button in Edge for Android and choose Extensions. Swipe down to AdGuard AdBlocker and tap Get (1 in our screenshot above). Press 'Add' to install the extension in the mobile browser.

Edge will open a new tab where you can configure AdGuard's settings. It blocks ads automatically, but you can also set it to block trackers, social-media widgets,

---

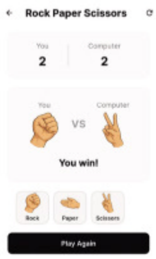
Best new apps What you should install this month

LUCK BY CHANCE

Free

Android tinyurl.com/APC551luck

This quirky but useful app provides multiple ways to help you make decisions. You can flip a virtual coin, roll a dice or get a yes/no/maybe answer to the question you're considering. 'Luck by Chance' can also generate passwords, lottery numbers and compliments, and includes fun games such as 'Rock, paper, scissors'.


Rock Paper Scissors
You 2
Computer 2
You
Computer
VS
You win!
Rock
Paper
Scissors
Play Again

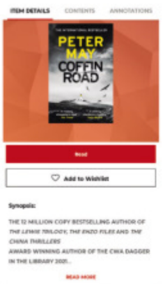
KOBO BOOKS

Free*

Android tinyurl.com/APC551kobo

iOS tinyurl.com/APC551koboio

Kobo has redesigned its app and added several useful features for ebook lovers. You can now swipe from page to page using your thumb; automatically sync your bookmarks, notes and highlights with your Kobo e-reader; and read and listen to free ebook and audiobook samples without signing into a Kobo account.


PETER MAY
COFFIN ROAD

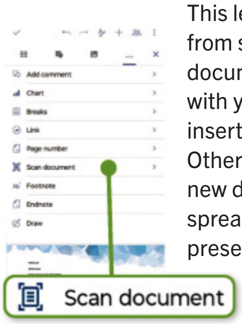
ONLYOFFICE DOCUMENTS

Free

Android tinyurl.com/APC551ocr

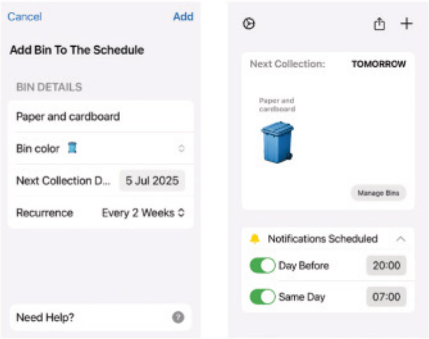
iOS tinyurl.com/APC551ocrio

OnlyOffice has updated the mobile version of its free office suite with OCR support. This lets you extract text from screenshots and documents you scan with your camera and insert it in documents. Other additions include new drawing tools in the spreadsheet and presentation editors and support for markdown.


Add comment
Chart
Breaks
Link
Page number
Scan document
Footnote
Endnote
Draw
Scan document

*Contains in-app purchases

Best apps for... Lifestyle-related reminders



Cancel Add
Add Bin To The Schedule
BIN DETAILS
Paper and cardboard
Bin color
Next Collection D... 5 Jul 2025
Recurrence Every 2 Weeks
Need Help?

Next Collection: TOMORROW
Paper and cardboard
Manage Bins
Notifications Scheduled
Day Before 20:00
Same Day 07:00

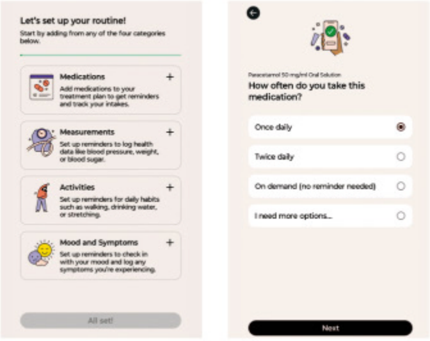
BIN COLLECTION REMINDER

Free

iOS **tinyurl.com/APC551bin**

Ensure you never miss a bin day using this simple app. Add a bin's details and colour (such as paper recycling, blue), the next collection date and the frequency. Schedule reminders for the night before and same-day morning to ensure you put your bins out in time. For Android, try the similar Bin Reminder (**tinyurl.com/APC551bina**).

Best for: Bin-day reminders



Let's set up your routine!
Start by adding from any of the four categories below.
Medications — Add medications to your treatment plan to get reminders and track your intakes.
Measurements — Set up reminders to log health data like blood pressure, weight, or blood sugar.
Activities — Set up reminders for daily habits such as walking, drinking water, or stretching.
Mood and Symptoms — Set up reminders to check in with your mood and log any symptoms you're experiencing.
All set!

Paracetamol 50 mg/ml Oral Solution
How often do you take this medication?
● Once daily
○ Twice daily
○ On demand (no reminder needed)
○ I need more options...
Next

MYTHERAPY PILL REMINDER

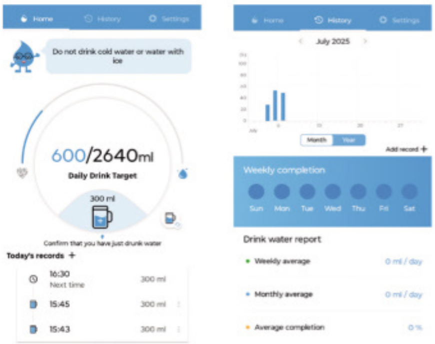
Free*

Android **tinyurl.com/APC551pill**

iOS **tinyurl.com/APC551pillio**

MyTherapy reminds you to take your medication at a scheduled time every day. You can add details manually or scan barcodes, specify the frequency and dosage, and get alerts when you need to order a repeat prescription. The app can also remind you about blood-pressure and blood-sugar readings, and medical appointments.

Best for: Medication reminders



Do not drink cold water or water with ice
600/2640ml Daily Drink Target
300 ml
Confirm that you have just drunk water
Today's records
16:30 Next time 300 ml
15:45 300 ml
15:43 300 ml

July 2025
Month Year
Add record
Weekly completion
Sun Mon Tue Wed Thu Fri Sat
Drink water report
Weekly average 0 ml / day
Monthly average 0 ml / day
Average completion 0 %

WATER REMINDER

Free*

Android **tinyurl.com/APC551drink**

This app ensures you drink enough water every day. Enter a few details about yourself and it will generate a hydration plan and remind you when to drink your glass, bottle or jug of water. Confirm you've done so and track your progress over time. For iOS, try an app with the same name from another developer: **tinyurl.com/APC551drinkio**.

Best for: Hydration reminders

phishing and malicious websites, and sponsored links in search results.

To see how many ads the extension has blocked, tap Edge's three-line menu and choose Extensions, then AdGuard AdBlocker. You can allow ads on specific sites by pressing the green slider **2** to turn it red and temporarily disable protection.

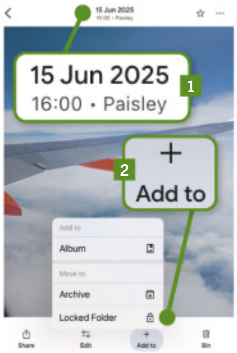
iOS

MANAGE PHOTOS IN GOOGLE PHOTOS MORE EASILY

Google has redesigned its popular Photos app. This makes several improvements to the app's interface, without losing its simplicity.

When you view a picture in Google Photos, it now shows the date, time and location the shot was taken at the top of your screen (**1** in our screenshot above). This is much more convenient than having to swipe up on the image to see this information.

The row of options along the bottom now includes an 'Add to' button **2**, which lets you add the photo to a new or existing album, or move it to your Archive or Locked Folder. 'Add to' replaces the Google Lens button, which has been moved to the three-dot menu in the top-right corner.



15 Jun 2025
16:00 · Paisley

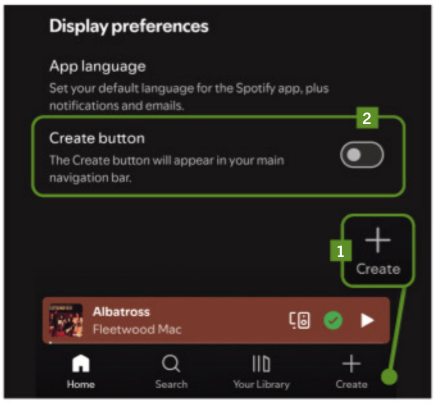
This menu also includes the options Download, Cast and Create. Tap the latter to create a collage, cinematic video, photo print or canvas print featuring the current photo.

Previously, Google Photos always displayed pictures on a black background, but it will now use a white one if you have the Light theme enabled.

ANDROID & iOS

HIDE THE CREATE BUTTON IN SPOTIFY

Spotify has updated its app for Android (**tinyurl.com/APC551spot**) and iOS (**tinyurl.com/APC551spotio**) to let you disable one of its most unpopular features: the Create button. Added to the Spotify toolbar last year, this gives you access to options including collaborative playlists, AI playlists and 'jams' (listening sessions with other people), but many Spotify users find it more annoying than useful.



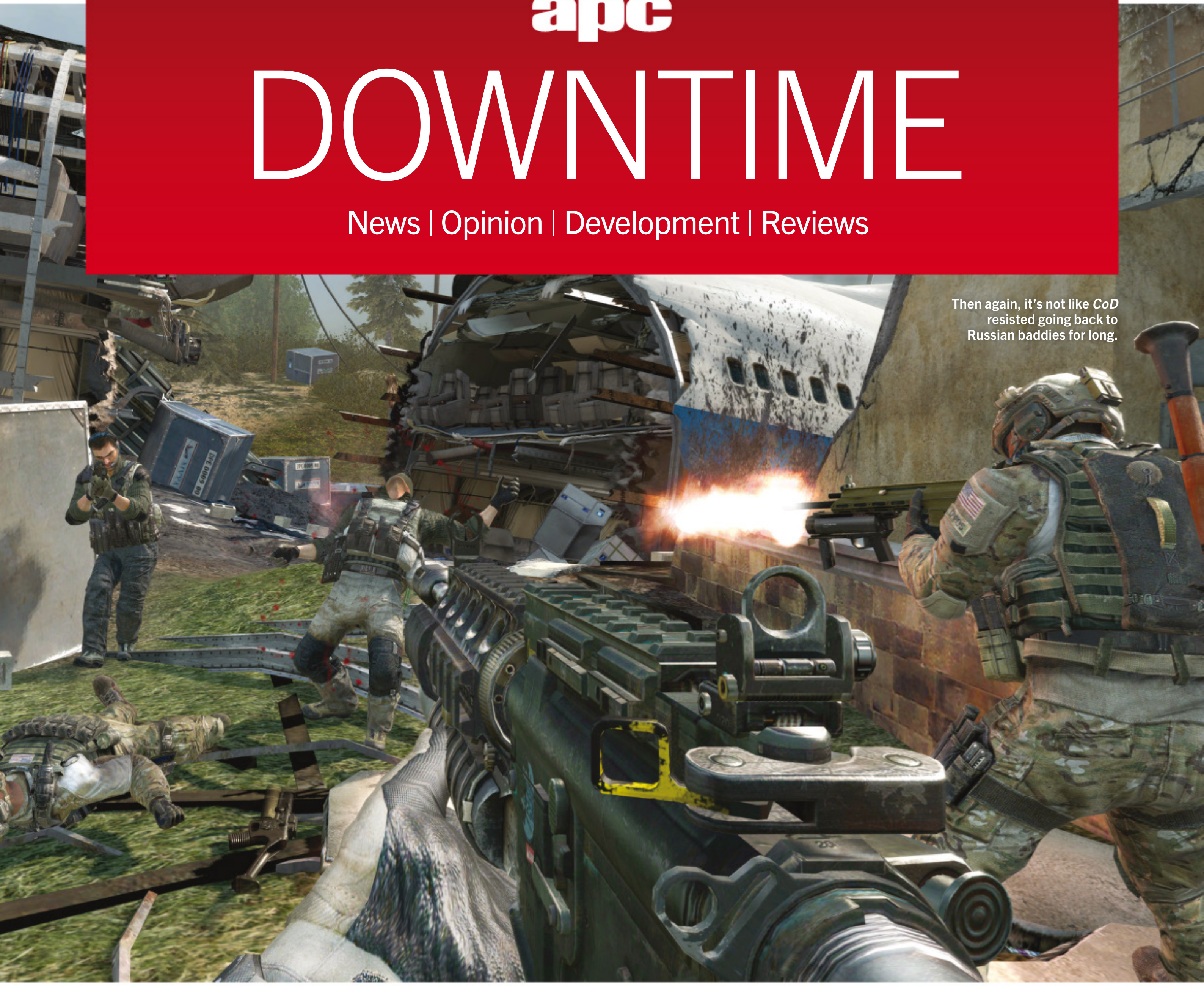
Display preferences
App language
Set your default language for the Spotify app, plus notifications and emails.
Create button
The Create button will appear in your main navigation bar.
Albatross
Fleetwood Mac

The position of the Create button, in the bottom-right corner of the app's interface (**1** in our screenshot above), makes it easy to tap by accident when accessing your Spotify music library. It's not even essential for creating playlists, because its features are also available by pressing the plus-sign button in the top-right corner of your library. To remove the Create button, tap your profile picture and choose 'Settings and privacy' then 'Content and display'. In the 'Display preferences' section, switch off 'Create button' **2**. The feature will instantly disappear and Spotify's toolbar will be restored to its traditional three-button appearance. ■

apc

DOWNTIME

News | Opinion | Development | Reviews



Then again, it's not like *CoD* resisted going back to Russian baddies for long.

No Russians

Call of Duty's director ditched enemy nations so he could visit without bodyguards.

FRASER BROWN

Call of Duty **has been around the block a few times, and across the years it's turned a lot of foreign countries into videogame enemies. In contemporary or near-future games, though, that can be problematic, as former** ***Call of Duty*** **director Glen Schofield realised when he was promoting the first incarnation of** ***Modern Warfare 3*****.**

"I was doing 30 days of press for *Modern Warfare 3*," he tells us during a wide-ranging chat about his history with the series. "I'm all over the world, and the last stop is in the UK, and I'm having dinner with some journalists from the UK and I get a call. They say, 'We need you to go to Russia tomorrow and do some more press.' And by then, I was really tired. I'm like, 'Do you know who the enemies are in *Modern Warfare 3*?' They're like, 'Don't worry, we'll have a bodyguard with you.' And I'm like, 'I don't feel any better.' And so I was a little worried about that aspect. And so I didn't go."

PMCS BECAME ADVANCED WARFARE'S VILLAINS

DISCOMFORT

That discomfort led to Schofield making a decision right there and then. "I came back to the journalists. I was sat down having dinner with them, and I said, 'OK, you know what, my next game is not going to have a country as the enemy. Because I want to go to those countries.' I didn't know what I was going to do, but I had said it out loud, and I'm like, 'Yeah, I'm going to do that, because I don't want to have this problem anymore.' And that's how the PMC

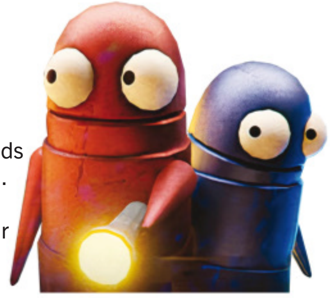
Pinball wizard

SPEED BALL

You remember that pinball game in Windows, with the little space guy? According to its programmer, Dave Plummer, it had a bug that would see it run as fast as possible. On anything modern, it would run "at, like, 5,000 frames per second". ■

Recharge

LOST MY MIND



REPO's upcoming update will add the ability to speak to your friends or distract any monsters threatening your friends even after you've lost your head. Be warned though, your spare battery depletes quickly, so your cry for help or leap of faith will need to be short and sweet. ■

PT Plz

KAMIYA THROWS DOWN

We all wish we could've seen more *PT* – Hideo Kojima's *Silent Hills* project that died when he split up with Konami. That includes *Bayonetta* director Hideki Kamiya, who said if Kojima never gets to make a follow-up to his 'Playable Teaser', "maybe I'll do it myself". ■

TOP: *Advanced Warfare* ditched nationstates for PMCs.

ABOVE: Schofield was worried foreign countries might take issue.

started. I started thinking about private military companies."

So a corporate megalomaniac and PMCs became *Advanced Warfare*'s villains. Which is safer. Nobody really likes them. But this decision wasn't solely born out of a desire to visit foreign countries without the need for private security. Schofield was also reckoning with jingoism, colonialism and American interventionism – things that have been historically presented without much criticism in big American action games.

BROKEN COUNTRY

"I got an MBA, I was doing that at nights, and one of my cohort was from another country, Iraq," he recalls. "And she and her family had to escape, and they did. Their uncle had been arrested by Saddam Hussein," but was let go. "And they asked the uncle, 'Do you want to escape with us? We're going to go someplace with democracy.' And he said, 'Democracy? I don't need democracy. They show up and they do their thing, and then they leave, and we got a broken country. I got everything I want here.'"

This stuck with Schofield, to the extent that he made it the basis for a speech given by *Advanced Warfare*'s villainous CEO Jonathan Irons. ■

Highs & Lows

HIGHS

Todd Forbid

The Lusty Argonian Maid only got into *Elder Scrolls* because its writer snuck it past Todd Howard.

Culture Vulture

Witcher creator Andrzej Sapkowski got a gold Polish culture medal.

Skong Big

A *Silksong* gumshoe pixel counted both games to compare the size of their worlds, and Pharloom looks twice as big as Hallownest.

Not Proud

RuneScape boss says he killed new Pride events to keep things going "as apolitically as possible".

Ninten(please)don't

A videogame IP lawyer says Nintendo's latest patents on *Pokémon* mechanics "should not have happened, full stop".

Zhongwen Bu Hao

Silksong sank to Mostly Negative Steam review status among Chinese gamers over its bad translation.

LOWS

Incoming

THE BIGGEST GAMES ON THE WAY

1 month

RELEASE October 10, 2025

DEVELOPER Battlefield Studios

BATTLEFIELD 6

Multiplayer and singleplayer FPS action returns in the new all-out warfare experience. Drive tanks, fly planes and helicopters, as well as shoot on foot with your squad.

RELEASE October 2025

DEVELOPER The Chinese Room

VAMPIRE: THE MASQUERADE – BLOODLINES 2

Fight your way through a modern-day Seattle on the brink of an open war as an elder vampire. The long-awaited first-person World of Darkness RPG is almost here. Hype!

RELEASE October 29, 2025

DEVELOPER Obsidian Entertainment

THE OUTER WORLDS 2

Further interplanetary action and adventure from Obsidian, with both a revolution and an invasion taking place in a galaxy that reacts to your decisions.

2 months

RELEASE November 4, 2025

DEVELOPER Paradox Tinto

EUROPA UNIVERSALIS V

Paradox Interactive's flagship historical grand strategy game returns. Use war, trade or diplomacy to satisfy your grandest ambitions and dominate five centuries of history.

RELEASE November 13, 2025

DEVELOPER Ubisoft Mainz

ANNO 117: PAX ROMANA

The latest entry in the long-running *Anno* series promises to let gamers shape the Roman Empire in their image, be that via strong economic growth or bloody warfare.

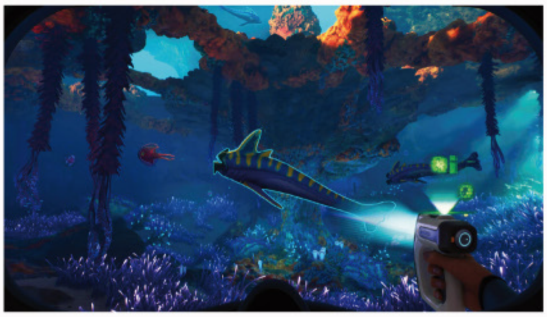
RELEASE November 14, 2025

DEVELOPER Treyarch, Raven Software

CALL OF DUTY: BLACK OPS 7

Robots, zombies and guns, lots of guns. The latest co-op and multiplayer shooter promises to be the most mind-bending *Black Ops* ever.

3 months



RELEASE 2026

DEVELOPER Unknown Worlds Entertainment

SUBNAUTICA 2

An open-water survival game where you must craft vehicles, tools and bases to survive on a mysterious alien world. Visually, this is looking like a total treat.

RELEASE 2026

DEVELOPER IO Interactive

007 FIRST LIGHT

Step into the shoes of James Bond before he attained his 00 status. From the makers of *Hitman*, this third-person action-adventure game promises espionage and quips.

RELEASE 2026

DEVELOPER Capcom

ONIMUSHA: WAY OF THE SWORD

Wield a variety of deadly weapons as famous sword master Miyamoto Musashi. Incredibly visceral and kinetic combat is promised as Musashi fights through Edo-era Kyoto.

4 months+

RELEASE TBC

DEVELOPER Mundfish

ATOMIC HEART 2

The bonkers Soviet Union-themed *BioShock*-like returns for more violence. If you're a sucker for dystopia and retrofuturism then this is one to keep an eye on.

RELEASE 2026

DEVELOPER Playground Games

FABLE

A reboot of the old action-RPG series originally crafted by Peter Molyneux's Lionhead Studios, *Fable* promises a visually spectacular return to the fantasy world of Albion.

RELEASE TBC

DEVELOPER Bit Reactor

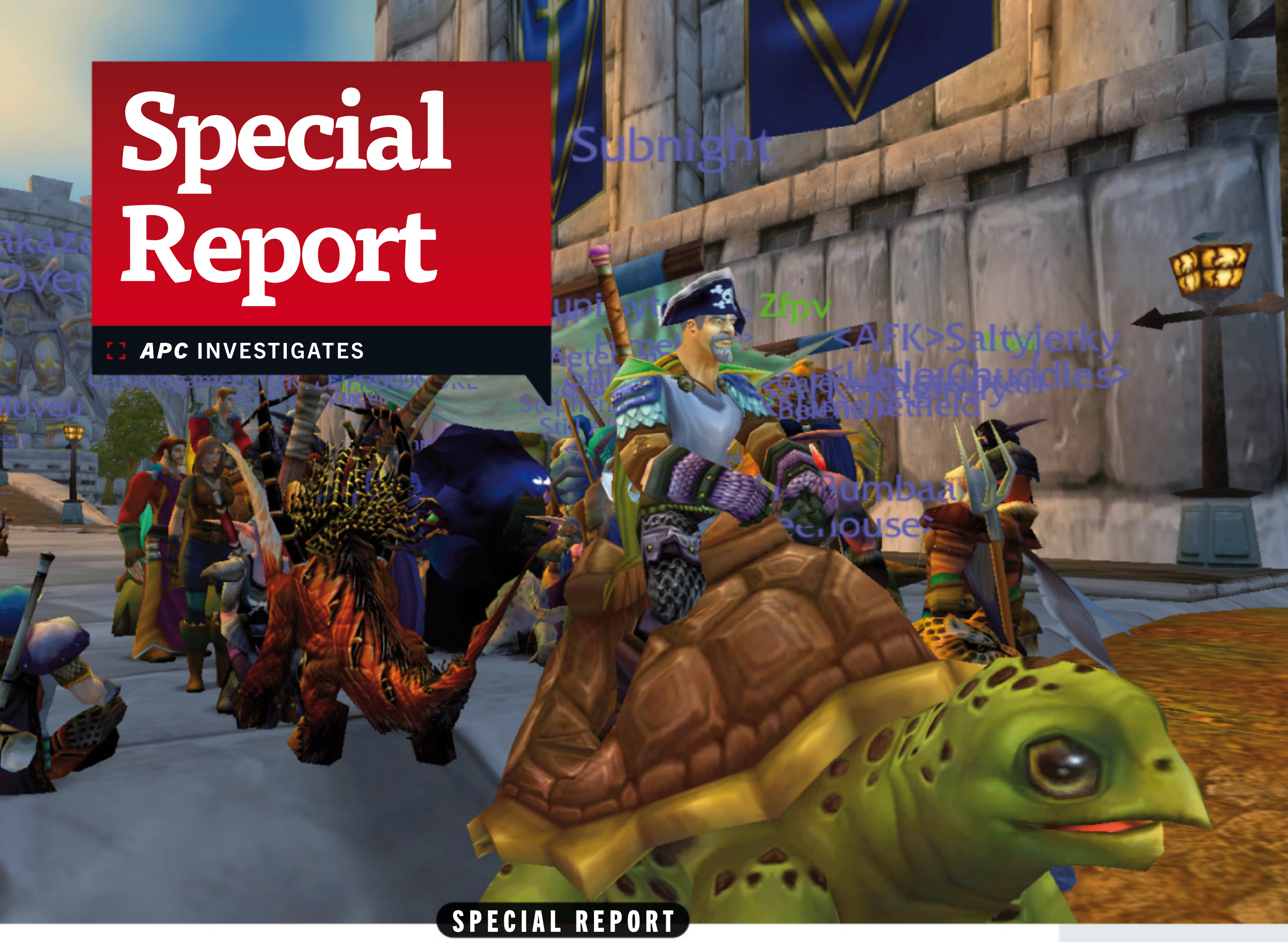
STAR WARS ZERO COMPANY

What happens if you take the turn-based combat system from *XCOM* and smash it together with the Star Wars universe? *Zero Company* is what happens.

MOD

BOOGIE KNIGHTS

Wants to take a well-earned break from crushing 10,000 Mud Crabs in *Oblivion Remastered*? Well, why not strip off that armour and boogie your blues away with CosmicBoogaloo's excellent *Dance and Emote Animation Pack*? Grab it here: tinyurl.com/APC551boogie



Special Report

APC INVESTIGATES

SPECIAL REPORT

Turtle World

Turtle WoW has become one of *World of Warcraft*'s biggest private servers.

There are a lot of *Worlds of Warcraft* these days. I don't just mean the original – which fans now call 'live' or 'retail' – and the official lineup of old-school 'classic' servers set in various points throughout the game's history. There have always been private servers: fanmade builds hosted unofficially, often locked to an old patch or with major changes. And though they're typically snug in the underground with a few hundred players or so to their name, one relatively new server has been turning more heads. Around 72,000 simultaneously, in fact, at its current peak player count.

That number comes from Akalix, the community manager on *Turtle WoW*. Named for a design philosophy that favours slow-paced, social gameplay over intense dungeon crawls and showers of disposable loot, the server takes the pre-expansion 'vanilla' version of *World of Warcraft* and throws in a whole bunch of new dungeons, balance adjustments, and a pair of new races.

The average day brings in around 10,000 concurrent players at peak hours, making it one of the biggest private servers going – and as the team behind it continues work on new custom raids and a move to Unreal Engine 5, it's one of the most ambitious, as well.

What sets *Turtle WoW* apart from most servers remixing the popular MMO is a distinct polish and restrained approach to changes. I wasn't surprised to see playable high elves, but I was surprised to see *Turtle*'s take on a high elf starting zone, with custom NPCs and quests and original music. It's all very careful not to add anything that might have been tonally out of place in 2004. Additions are justified with in-game lore from the era, new art assets are quality (or borrowed from official expansions) and more or less blend in with the old ones, and crucially, the maximum level has never budged from the original 60 since the server launched in 2018.

"We do not want to desecrate the design," Akalix says. "We don't want to trample over 2004 Blizzard's idea of this universe. We want to do as much as we can to play within and pay homage to the *World of Warcraft* vanilla and [*Warcraft* RTS series] era of lore. Our entire project's goal is to say, 'this what we think Blizzard would have done if they want a different route… if they just kept adding more updates that expanded Azeroth.'"

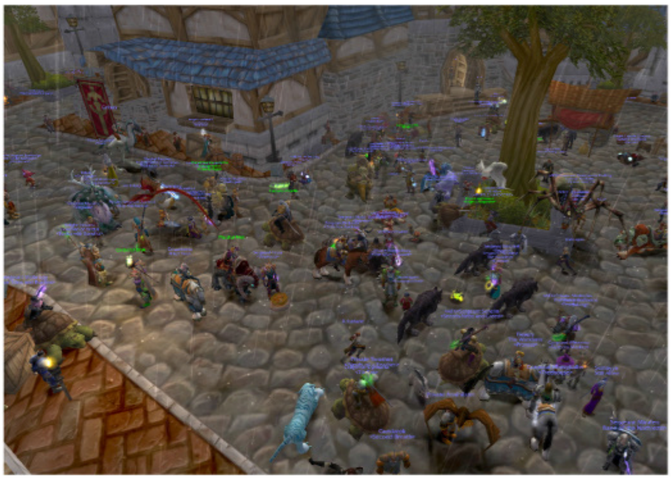
Modern Blizzard did its own remixed take on classic *World of Warcraft: Season of Discovery*, which added new instances and class abilities before it wound down earlier this year. But while those servers backported powerful spells from the live game and offered

Worlds aplenty

Official *World of Warcraft* servers include the modern game, a classic version that never moves on from the original pre-expansion version, and the classic progression servers which go through each expansion in release order at an accelerated cadence. Private servers are a wider umbrella catering to more specific tastes, but aside from rare permitted cases like *City of Heroes: Homecoming*, they're usually against the rules.

Mindless Zombie

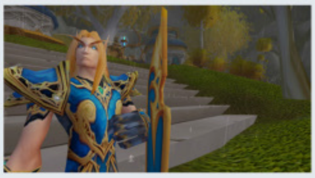
Bells and whistles aside, the grind is exactly as you remember it.



Without server sharding, you'll experience all the pros and cons of a bustling faction capital.

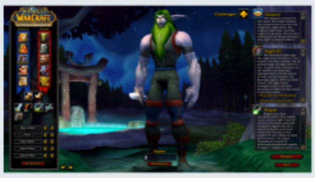
TURTLE POWER

The modded server's foremost additions



NEW PLAYABLE RACES

High elves and goblins join the game's playable selection straight from your *Warcraft III* hero lineup.



NEW CUSTOMISATION OPTIONS

New hairstyles, beards, tattoos and combinations of class and race are available right from character creation.

NEW ZONES

From new raid instances to low-level dungeons, there's more of Azeroth on display here than you might remember.

CHALLENGES

Ever wanted to see if you could get to max level by killing boars? Maybe not, but *Turtle WoW* has you covered anyway.

substantial experience boosts for new players, *Turtle* is careful to retain the funky buildcraft and glacial pacing that make classic solo play more difficult. When no one class can do everything, you need to lean on others to do anything.

It's the same reason you won't find group matchmaking or meeting stones that teleport players to the latest dungeons from halfway across the world, which are commonplace in the live MMO. These conveniences are common requests – after all, if someone wanted to experience every hardship exactly as it was, official classic servers do exist.

Akalix says finding out how much change is too much is a bit of a tightrope walk, but the guiding principle of *Turtle WoW* is that it fails unless it eschews anything that could impede socialisation and cooperation.

"If you're part way into [a dungeon], and one of your DPS is obviously newer to the game, he walked into a pack, pulled them, and got your group wiped once. In the random dungeon finder on retail right now… it's just a matter of 'Kick 'em, we'll get a new person in 30 seconds and not have to deal with that again,'" he says. "The old style makes you more invested in seeing your group succeed."

It's a grognardish sensibility familiar to any fan of old-school *Runescape*, *EverQuest*'s *Project 99*, or the old-school renaissance taking the TTRPG world by storm right now, and Akalix does admit *Turtle* has built a reputation as a 'dad server'.

But to the team, that only highlights the appeal. "We've kind of embraced it in a way. Like, yeah. It's a great server for a dad to come play on … [*Turtle*] is not a game where you have the infinite treadmill. There's not this super-high level of commitment."

NO GUARANTEES

But while it does have a pick-up-and-play draw, it's like any other private server in that there's no guarantee it'll be here forever. It's against *World of Warcraft*'s terms of service to host a custom server at all, and while there's not exactly a cash shop in *Turtle WoW*, there is an in-game store where donations to the development team can be converted into tokens and exchanged for cosmetic rewards.

When Blizzard ended development on *Season of Discovery* in 2025, it hinted at other experiments in the classic design space that may end up looking a lot like *Turtle*. Akalix said there's no way to know what tomorrow will bring, and that at the end of the day, *Turtle* is a passion project that will continue for as long as it's feasible.

IT'S A GROGNARDISH SENSIBILITY FAMILIAR TO ANY FAN OF OLD SCHOOL RUNESCAPE

"We can never know for sure what's going to happen. We are not mind readers, nor are we at Blizzard, but I can say confidently that I'm pretty certain there are some people from Blizzard who have even played on *Turtle*. I can tell you for certain they know that we exist," he said. "We are just here because we love *World of Warcraft* … we obviously hope we are able to stick around for years to come. We plan to stick around for years to come." ■

Justin Wagner

FUN & GUN

Borderlands 4 is so good, even a bad UI can't ruin it.

BY HARVEY RANDALL

***Borderlands 4* might just be the best game in the whole 16-year-old series, but trapped in a prison of terrible choices. This, however, didn't stop me from losing 47 hours of my life to a blissfully loot-driven blur. This leads me to two conclusions: Either my brain is truly broken, or the core loop in *Borderlands 4*'s clunky heart is seriously that strong.**

This is not a series that innovates, and I don't think Gearbox has reinvented the wheel here, either. What the studio has done is make the perfect wheel, then presumably gone, "Crap, we spent all our budget on a wheel," and put it on a clunky used car with steering that keeps locking up.

I make this assumption because the game's most glaring issues are such blunders that I simply cannot fathom how they happened – they are baffling – although, hopefully patchable, and soon. And yet, I've never felt so utterly absorbed by a game I have so many nitpicks with. But before I air my grievances, let's get onto the good.

> I've never felt so absorbed by a game I have so many nitpicks with

GOT MY TEMPO

The ARPG loop at the core of *Borderlands 4* has cast a spell on me. In fact, it's downright trancelike. The game's new open-world structure marries so well with the shoot, loot, repeat treadmill that I'm shocked it's taken Gearbox so long to do it.

I wasn't sure about it at first. Opening the big map of Kairos immediately struck me with Ubisoft fatigue. No one likes looking at a to-do list, and *Borderlands 4* has one of the longest.

But the more I played, the more I realised that Gearbox has spent five whole games kinda wasting its time. The more traditional ARPG levels of the series' past were shackles weighing the whole thing down.

I spent the early game of *Borderlands 4* getting sidelined. I'd keep telling myself I'd do the story. "I'll just do this one objective," I'd say, veering off the straight and narrow. Then three hours later I'd wake up, three sidequests, six objectives and two levels deep into distraction.

Keeping tempo under all of that is what makes games like *Diablo* and *Path of Exile* so gripping. You turn hordes of enemies into paste, pick up an armoury of loot, head back to base to sell most of it, rinse and repeat until your eyes are bleary and you realise you haven't drunk water in five hours. It's one of the strongest dopamine treadmills I've experienced. The pure, distilled essence of 'number go up'.

This is helped by the fact the story mostly gets out of the way of the shooting. I won't dwell on it because there's not much to dwell on – it's incredibly serviceable with a couple of bright moments and some fun character work, while the cutscenes are nicely animated and help breathe life into its cast. The post-*Borderlands 3* course correction has, in fact, fixed its heading. Pats on the back for everyone. As for the rest of the game's design, it's either incredibly solid, or a complete and utter shambling mess.

FRAMES FOR THE WICKED

Borderlands 4 isn't a game that runs well, no matter what Randy Pitchford says. My first hours of the game were marred with constant stuttering and slowdowns – at one point, the game struggled to stream in its textures so much it ground to a literal halt.

Some of this has been alleviated – Gearbox released a patch on the game's first weekend that helped considerably, and setting my Nvidia card's shader cache to 100GB nixed the problem entirely. Even then, I cannot say the game ran well.

Granted, I am below the recommended specs: I have an RTX 3060, not a 3080. I have 16 gigs of RAM, not 32 – but I believe our hardware team, other players and most of the people begging Pitchford to please stop posting through it when they say that the game runs like garbage on a range of machines from low to high.

As for bugs, I encountered a couple. One issue appeared with the game's level scaling – sometimes, it'll

WHAT IS IT?
The latest looter-shooter by Gearbox Software, in which you run, gun, and grind your way across the prison planet Kairos

EXPECT TO PAY
$109.95

DEVELOPER
Gearbox Software

PUBLISHER
2K Games

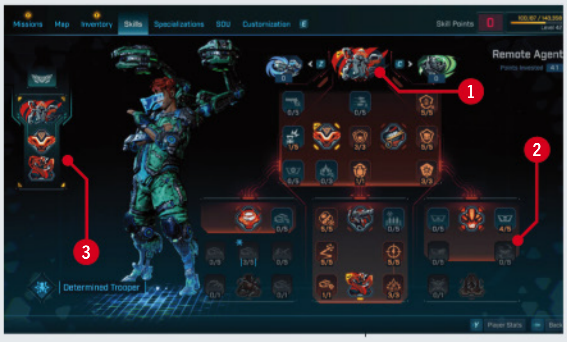
REVIEWED ON
AMD Ryzen 7 5800, 16GB RAM, Nvidia GeForce RTX 3060

MULTIPLAYER
Up to 4-player co-op)

WEB
borderlands.2k.com/borderlands-4

SO MANY BUILDS

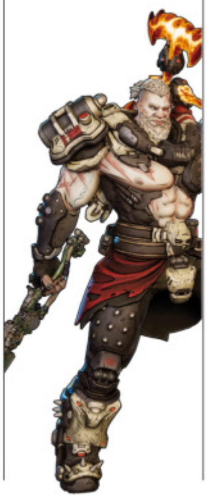
These trees rock.



1 ACTION MAN
Pick an action skill, the bread to your build sandwich.

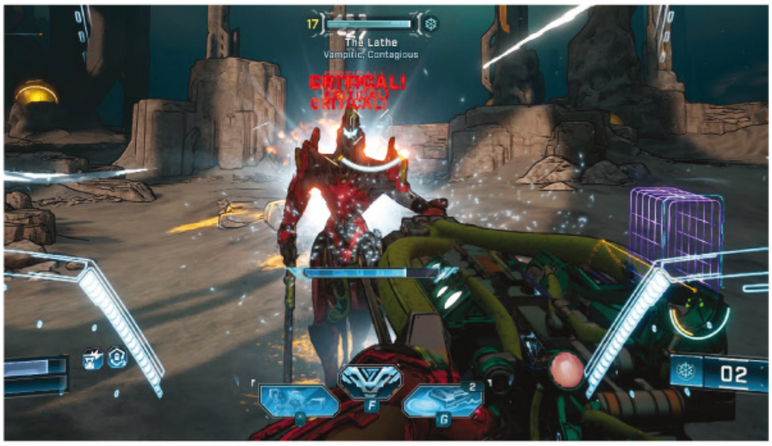
2 BRANCH OUT
Pick a skill-tree branch – each tree has three.

3 MIX & MATCH
Modify your action skill with an augment and a capstone.



They're about to drop the hottest mixtape.

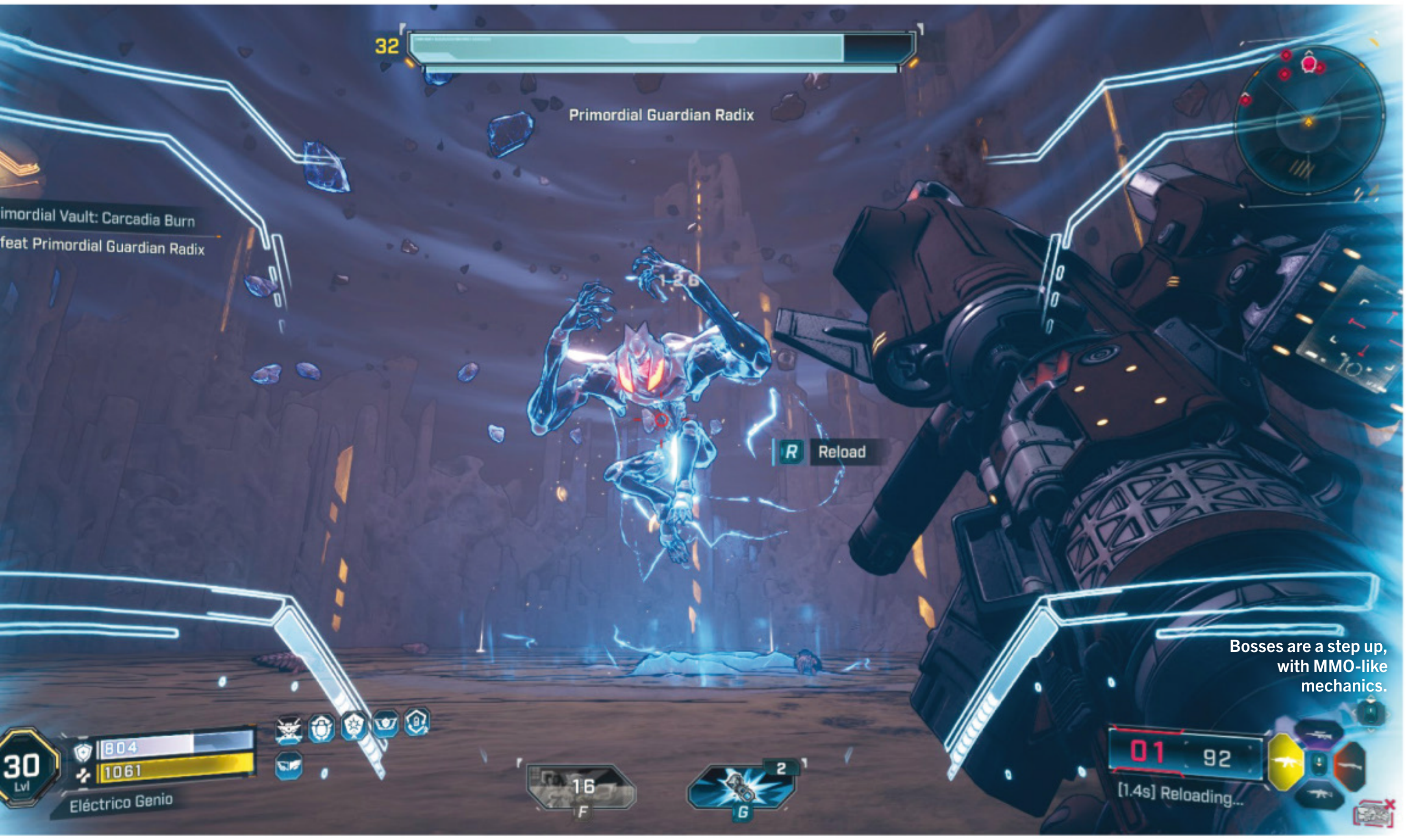
[Brody Sattva] you seek inner wisdom, NOTHING can stand in your way again.


17
The Lathe
Vampiric, Contagious
CRITICAL!
CRITICAL!
CRITICAL!
F
G
2
02

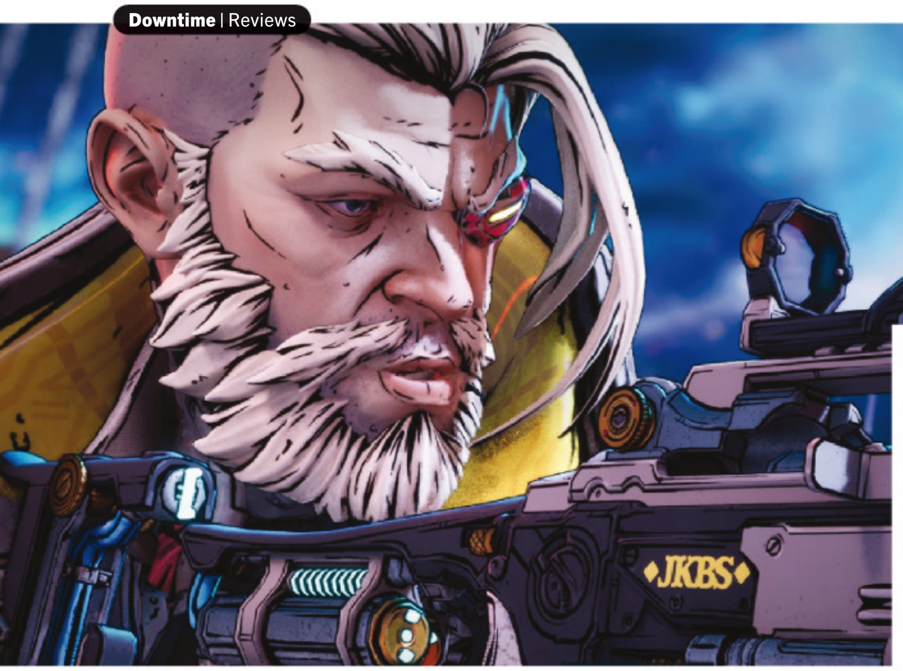
FAR LEFT: The Lathe is my future wrestler name.

LEFT: An accurate representation of me after my tenth frame stutter.

BELOW: Bosses are a step up, with MMO-like mechanics.

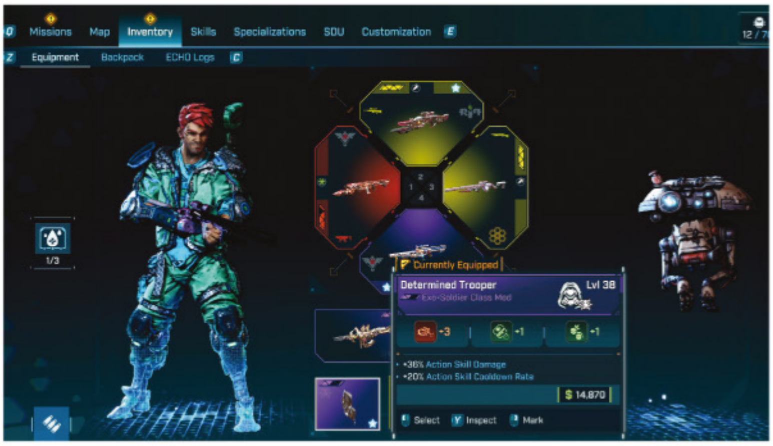

32
Primordial Guardian Radix
imordial Vault: Carcadia Burn
feat Primordial Guardian Radix
R Reload
30
Lvl
804
1061
Eléctrico Genio
16
F
2
G
01 92
[1.4s] Reloading...

Bosses are a step up, with MMO-like mechanics.

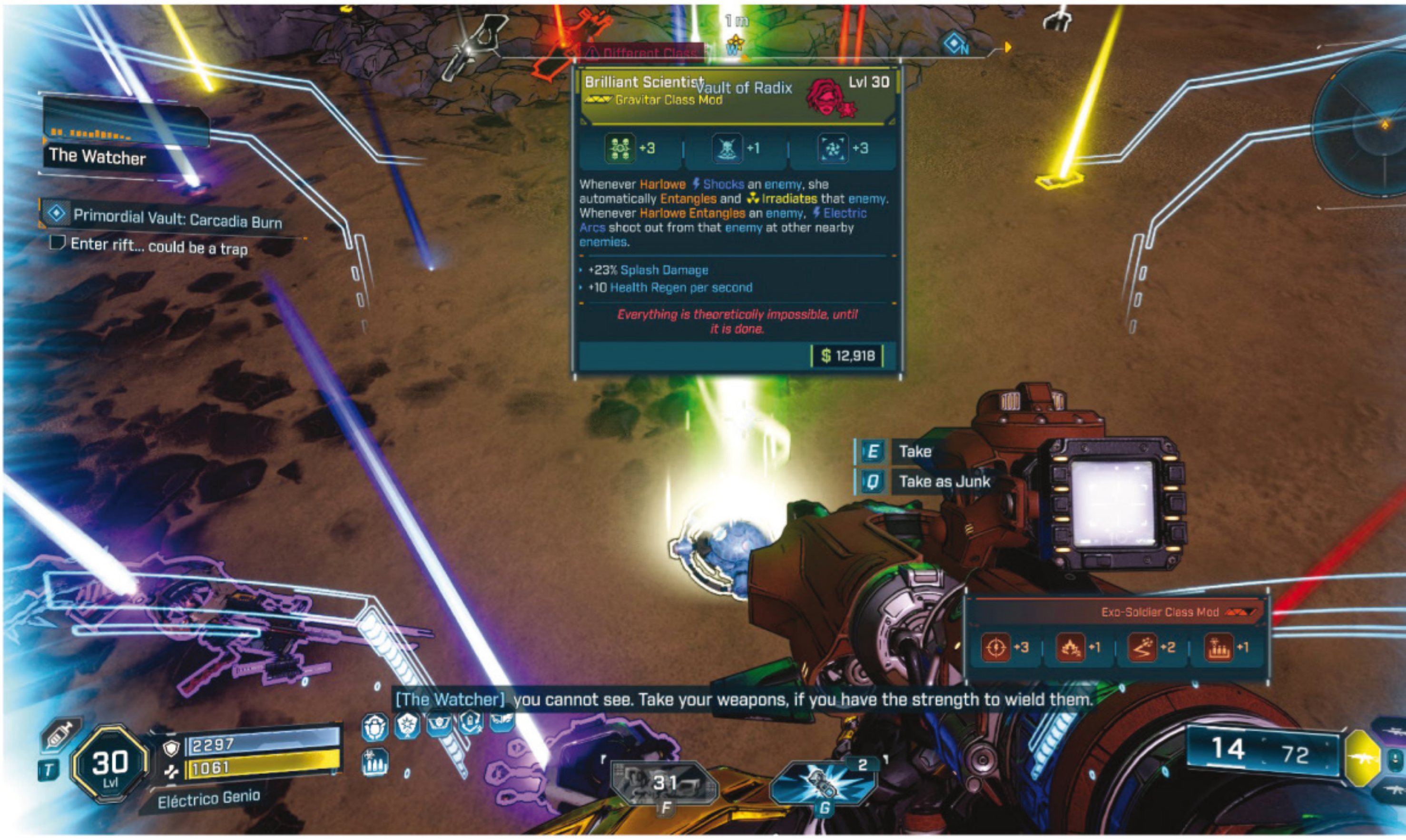


RIGHT: The new faction, The Order, is full of creepy synths.

BELOW: Legendries have big build implications.


Missions
Map
Inventory
Skills
Specializations
SDU
Customization
Equipment
Backpack
ECHO Logs
1/3
Currently Equipped
Select
Inspect
Mark

Determined Trooper Lvl 38
Exo-Soldier Class Mod
-3 +1 +1
+36% Action Skill Damage
+20% Action Skill Cooldown Rate
$ 14,870


The Watcher
Primordial Vault: Carcadia Burn
Enter rift... could be a trap
Different Class
Vault of Radix
Take
Take as Junk
30
Lvl
2297
1061
Eléctrico Genio
31
F
2
G
14
72

Brilliant Scientist Lvl 30
Gravitar Class Mod
+3 +1 +3

Whenever Harlowe Shocks an enemy, she automatically Entangles and Irradiates that enemy. Whenever Harlowe Entangles an enemy, Electric Arcs shoot out from that enemy at other nearby enemies.

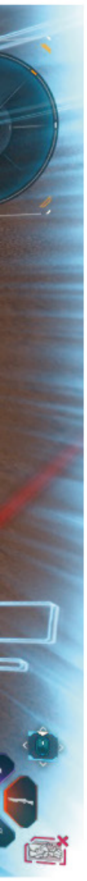
- +23% Splash Damage
- +10 Health Regen per second

Everything is theoretically impossible, until it is done.

$ 12,918

Exo-Soldier Class Mod
+3 +1 +2 +1

[The Watcher] you cannot see. Take your weapons, if you have the strength to wield them.



just hurl overlevelled enemies at you, as it did for me in its final act, randomly pitting me against level 42 foes when I was a measly level 38. I managed to overcome this by simply pushing ahead, and when I got to the next instanced area, everything was scaled to my actual level again.

But my real problems aren't to do with the frames or scaling issues – I can deal with choppy waters if the boat's nice – they're to do with a UI so poorly conceived it has to be some kind of practical joke. *BL4*'s backpack screen, for instance, is basically useless.

DEEP BREATH

Equipped items aren't listed first, and are marked by a tiny tick that's easy to miss. You have to press a separate button to compare your loot. Everything's organised in an unassailable grid, and there's a ton of robust filters some developers clearly worked very hard on – none of which matter, because for some madcap reason it auto-sets sorting to "by manufacturer".

You can send things to your bank directly, which is nice, but that requires right-clicking, marking as 'bank', and then holding down a button press, instead of just having a 'send to bank' button when you right-click. Oh, and also sometimes when you mark something as trash, the game panics and actually marks an item two or three rows above the thing you're clicking on.

But it doesn't stop there, no no no. The widget for class mods is functionally useless – see, class mods give you free points in a handful of skills, but the UI only shows their icons. Inspect the class mod, and you only get their names. You need to equip the class mod, then go over to the skill tree, and then hunt to see which skills it affects. Why?

The crime of this is that inventory management in a game where you get heaps of loot absolutely has to be good – because you're going to be doing it a lot – and it's a complete trash heap here.

I spent my playthrough sorting most of my loot via the equipment screen rather than the backpack, since it let me compare my guns easily, organised my loot by type, and auto-filtered my gear. And if that isn't an indictment of your inventory system I don't know what is. Luckily, the actual RPG underpinning said loot fatigue was enough to keep me hooked, and the deeper I went, the more enamoured I became.

ON THE HUNT

What gives *Borderlands 4* the real juice are its vault hunters, and these are some of the best we've seen out of the series yet when it comes to variety.

Each character has a core passive, three skill trees, a choice of three action skills, and two modifiers to said action skills. Except within those skill trees, you also have three branches at the end which all play differently.

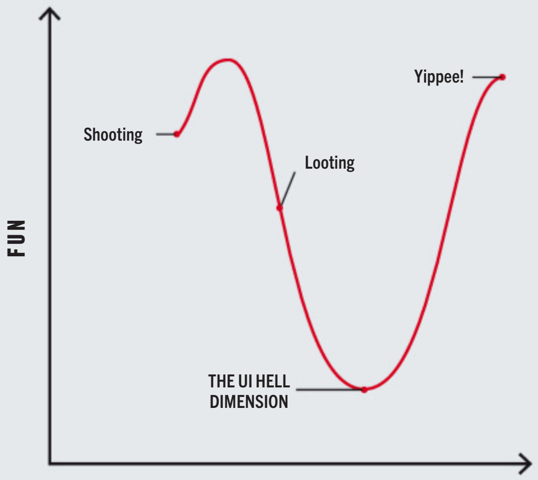
> **I got a legendary shotgun with three elemental damage types**

I spent my playthrough as Rafa using the Peacebreaker Cannons – and in his Peacebreaker Cannons tree, Rafa has three branches: one about movement speed and keeping Overdrive up (my choice), one that buffs his cannons with elemental damage, and another that lets him stack all sorts of bonuses into his indirect damage, making said cannons the star of the show.

In the post-game, I got a legendary shotgun with three elemental damage types – and I decided to swap over to that elemental tree, adding a passive modifier that turned my trusty rocket launchers into lasers and stripped me of my movement speed bonuses in exchange for raw status spread and face-melting DPS.

THE BORDERLANDS 4 CYCLE

Mostly having fun. Mostly.



It felt different, and it suddenly dawned on me that this was simply a change in which branch of a single skill tree I was in. After 47 hours, I had experienced two out of nine ways I could've played my character.

Add in legendary equipment modifiers, the new Firmware system, and the post-campaign specialisations tree, and Gearbox has given players a vast playground to muck around in.

The only complaint I have is that it takes a minute to get there. As is the case with most Borderlands games, the opening hours are a smidge slow, since you only get one skill point per level – but when characters come online at around level 15, that all melts away.

For all my gripes – and I do have quite a few of them – I still find myself itching to play more *BL4*. It speaks to the strength of the damn thing that one of the most terribly conceived UIs in recent memory somehow didn't ruin it for me. Even though you have to use said UI routinely.

I want to muck around with builds, I want to play co-op and, most importantly, I'm somehow not bored of shooting people and watching them explode into an utterly illegible cloud of numbers.

Borderlands 4 may well be the strongest game in the series – and while it flails in a sea of backwards choices, it doesn't quite drown. I've been loving my time with it, somehow, in spite of all of my problems with its clunky frame.

If you've ever had a serotonin spike from seeing a big number, if you've ever felt that blissful open world checklist haze, if you've ever enjoyed buildcrafting in an ARPG, then I recommend you give *BL4* a go. If you can run it – or stomach some bad inventory management – there's looter-shooter bliss on the other side of that trash heap. ■

VERDICT

★★★★☆

Even a terrible UI and choppy performance didn't spoil several dozen hours of numbers-go-up bliss.

apc EDITOR'S CHOICE

This big guy just wants a high four from Hornet.

PRICE $29.50 **PLATFORM** PC, PS4/5, XB1/S/X, Switch/2, Mac, Linux **WEB** tinyurl.com/APC551silk

Hollow Knight: Silksong

Proves that there is pleasure in pain.

Finally it's here, and I've spent over 25 hours with the videogame equivalent of sticking your hand into the Dune pain box. *Silksong* may be one of the most painful 2D action games I've played, and the worst part? I inflicted that pain on myself by pressing forward until I'd seen just about every inch of the bug-inhabited land of Pharloom. I may be bruised and sore from the experience, but I'm happy to say that for all the pain *Silksong* put me through, it was worth it.

Every shortcut and secret area contextualises the horrors you face in the bigger, sadder picture. A pristine dining room in the upper chambers of the citadel hides a kitchen caked in dust and decay, and just below that, in a secret room, lies the tangled corpse of a centipede pontiff. There's always something just out of view or lingering in the background that draws your eye, and those details always kept me hungry to see more. By the end of the game, I couldn't tell what was more exciting: the fact that I somehow dug my way into an entire zone I hadn't explored yet or the questions that new area raised about what's really going on with Pharloom's biggest mysteries.

Hornet, and the characters she runs into, are a splash of cold water in this gloomy dream. The thrill of playing as Hornet is what really anchors *Silksong* as a brilliant action game above all else. Skipping and dodging around enemies becomes a delicate dance that grows more and more intricate as you pick up new moves. I was merely poking at enemies in the first few hours of the game and by the end I was tossing out spike traps and silk missiles while bouncing between bugs like a pinball. When I wasn't getting clobbered, it felt like the tables had turned and suddenly I was the boss with the unfair, unpredictable attacks.

Silksong doesn't always get the balance between effort and reward right. Some games will make you find an access code to unlock a safe with a key in it – *Silksong* will make you fight with your bare fists through four waves of flies with crowbars to get a key that unlocks a door leading to more flies with crowbars. You're not even guaranteed to get anything after defeating a boss. For the first half, you'll be lucky to find a bench to rest on that isn't trying to kill you or take your money.

I can't tell you if the hype was worth it. But I can tell you that *Silksong* glows with a level of precision and imagination that's hard to find anywhere else. ■

VERDICT

★★★★½

Hollow Knight: Silksong can be ruthless, but it's hard to pry yourself away from its haunted little world.

TYLER COLP

> "There's always something just out of view or lingering in the background that draws your eye, and those details always kept me hungry to see more."

apc
HIGHLY RECOMMENDED

Doom knight suddenly realised the latest *APC* magazine is out.

PRICE $43.95 **PLATFORM** PC, PS5 **WEB** tinyurl.com/APC551sword

Sword of the Sea

A short but spectacular sword-surfing adventure.

Long story short: *Sword of the Sea's* surfing feels great. Whether it's blazing across rolling sand dunes with a pack of dolphins in tow, zooming down a snowy slope into a ski jump, or cresting the waves and leaving a foaming trail in your wake, I really feel like Giant Squid has achieved something special here. Though linear, each of the game's areas offer up big open spaces you can take time surfing around while also solving the puzzles needed to progress – not that any of the puzzles are particularly hard.

It's very much an atmospheric surfing game, emphasis on the atmosphere, as you enjoy the scenery and soundtrack (both of which are stellar, by the way), and the freestyle way you can use movement to explore each space.

All this is further complemented with additional tricks you can purchase from vendors you'll find, while you'll also gain additional movement abilities through the story as it progresses.

Vistas often drip with character.

Sword of the Sea isn't going to blow you away in terms of puzzling, narrative, or board-based tricks, but if you're looking for a surfing experience that's both chill and beautiful, you're in good company. There are some fantastic and joyful sequences as you travel through sand, sea and snow. You might find yourself a little bored by its simple and somewhat repetitive puzzles, but *Sword of the Sea*'s real strength lies in taking you from spectacle to spectacle, and for me at least, that was enough to sustain the experience and make it enjoyable, even when I found other elements a little lacklustre.

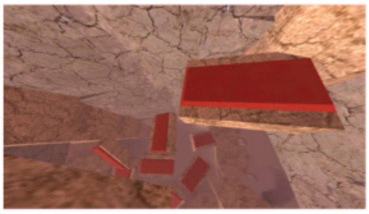
It's important to note that *Sword of the Sea* is also quite short. I completed the main game in just under four hours, and I wasn't by any means rushing, since I searched for collectibles in all but the final area, and purchased all but one of the tricks. Finishing the game unlocks new game plus, granting you a speedometer and a trick display for subsequent runs, if you're the kind of person who'll want to master surfing or try to speedrun. ■

VERDICT

★★★★☆

Sword of the Sea's atmosphere and movement propel it where its simple and repetitive puzzles can't.

SEAN MARTIN



PRICE Free
PLATFORM PC, Mac, Linux
WEB tinyurl.com/APC551fall

FALLSTRUKTUR

Explore a hole new world.

Welcome to the deviously slippery *Fallstruktur*, in which you have to hop down a hole filled in with bits and pieces of ruined, mysterious structures.

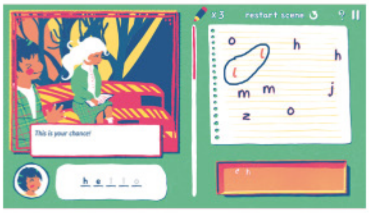
The thing about first-person falling is that it's not all that difficult, usually. You're given a good view of the chasm before you, and movement physics that are generally fast and immediately responsive. The movement speed is fast, and so is the running momentum, so you can attempt large jumps. However, in a world comprised of little bits of platforms, twisty tree trunks and slender roofs, it's very easy to overshoot a jump, or to undershoot. You're trying to get to the bottom, of course, though there's an asterisk and the small print says 'in one piece'. Fall just a few feet and it fades to black and restarts the game, resisting the visceral horror of the smashed-melon-head in a way I am thankful for.

VERDICT

★★★½☆

There's a huge feeling of satisfaction when you finally make progress, but I'm not fully onboard with it.

TOM SYKES



restart scene
– Everyone will just start running and screaming!
Collect letters above to prepare a phrase

restart scene
How can you help her?
Collect letters above to prepare a phrase

apc HIGHLY RECOMMENDED

PRICE Free
PLATFORM PC, Mac
WEB tinyurl.com/APC551love

LOVE LETTERS

Love letters? Then you'll love this.

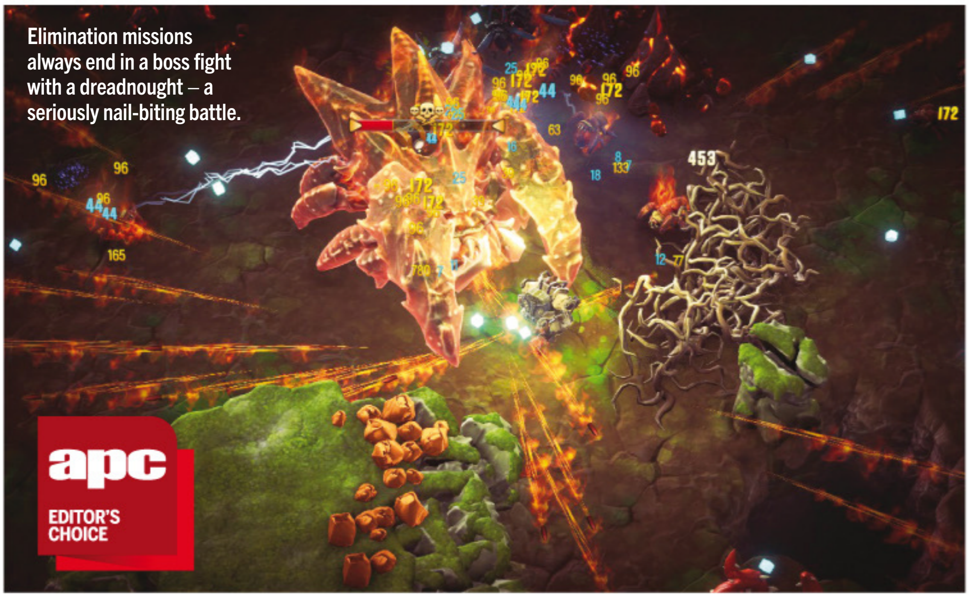
Few games combine mechanics and theme as well as *Love Letters*, where you help a lovelorn adolescent express himself in front of his classmate. He's too nervous to even say a word, so it falls to yours truly to help him speak, by constructing words from a jumbled pile. Each level presents you with a sentence to make, and you have to assemble the words from the box of letters on the right. Circle a letter, or a bunch of them at once, and they will automatically fill in the Hangman-like sentence. The puzzles support the narrative and the protagonist as he grows in confidence. In an alternate universe, these puzzles have been more fully explored, and I am left with a yearning for that, given how original the concept is here. If the limitations were even more limiting, by further restricting the number of circles you could make, or by disallowing circles that also have the wrong letters in them, *Love Letters* could have been a great puzzler.

VERDICT

★★★★☆

A very sweet love story, which is also a pretty good puzzle game.

TOM SYKES



Elimination missions always end in a boss fight with a dreadnought – a seriously nail-biting battle.

apc EDITOR'S CHOICE

PRICE $18.95 **PLATFORM** PC, XBS/X **WEB** tinyurl.com/APC551rock

Deep Rock Galactic: Survivor

Has finally dug its way out of Early Access, and it rocks.

The core action of *DRG:S* is deceptively simple. Your dwarf miner is dropped onto an alien asteroid and tasked with mining for resources and surviving against escalating hordes of bugs. Your weapons fire automatically, and as you level up you're able to add new guns and fine-tune them with stat upgrades and modifiers.

DRG:S's special sauce is found in its environments. Each stage is its own randomly generated cavern, and your dwarf's pickaxe allows them to burrow through the rock walls, creating their own tunnels and arenas. This is where combat gets tactical, because most bugs don't have that ability. As the swarms chase you, you're able to shape the landscape against them, escaping down tunnels, creating bottlenecks, or leading them in circles.

Different biomes add further wrinkles – from lava flows to skirt around or lead bugs through, to mushrooms that allow you to leap right over swarms, to thorny vines that regrow after you mine through them.

It all contributes to the game's wonderfully inventive feel. Whether you're luring an elite alien into being crushed by a falling supply pod, or dancing towards and away from a horde to trick explosive bugs into blowing up prematurely, it always feels like there's ways to get one up on the enemy.

The 1.0 release spices things up further with a whole new mission type – Escort Duty – which sees you accompanying a huge mobile drill across the map. It's a fantastic twist on the formula. The narrower passages and the need to stick close to your charge creates tense, claustrophobic battles without the luxury of fleeing to a different area when things get tough. At the same time, following the drill as it ploughs through rock and enemies with equal ease is a lovely little power trip.

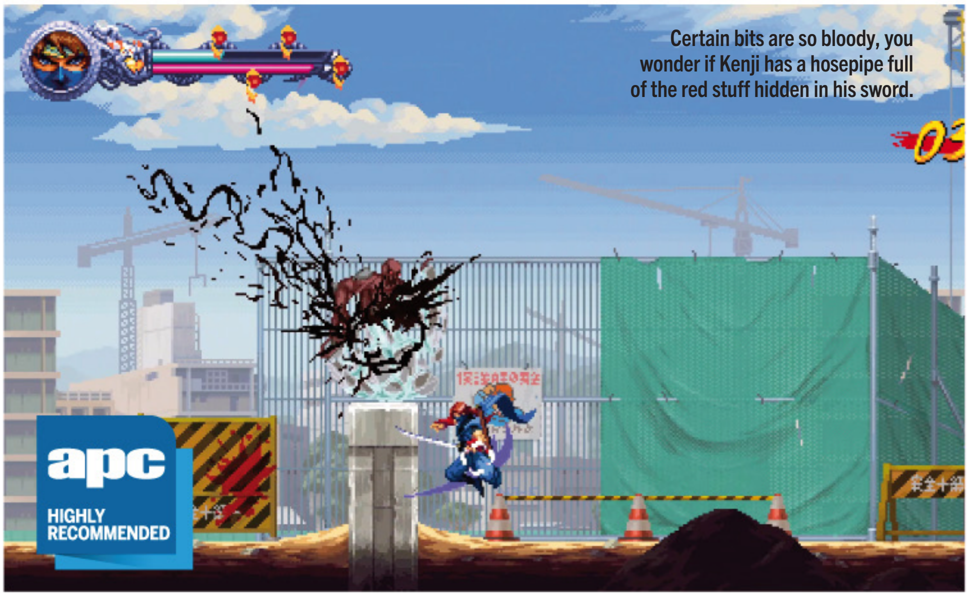
This release makes the game feel complete and ready for a broader audience, after over a year of public development. But at the same time, it feels like it could be only the beginning. ■

VERDICT

★★★★½

Funday Games' *Deep Rock Galactic: Survivor* proves Vampire Survivors is no longer the king of the genre.

ROBIN VALENTINE


Certain bits are so bloody, you wonder if Kenji has a hosepipe full of the red stuff hidden in his sword.

PRICE $36.50 **PLATFORM** PC, Switch, PS4/5, XBS/X **WEB** tinyurl.com/APC551ninja

Ninja Gaiden: Ragebound

The Blasphemous devs lighten up.

Well, this is a nice surprise. Previous *Ninja Gaiden* games have been about as warm and welcoming as being booted down a flight of stairs. But *Ninja Gaiden: Ragebound* has pulled off a fun revival that's far and away the most accessible *Ninja Gaiden* yet. And by 'most accessible' I mean 'it waits a few hours before repeatedly kicking you in the face'. Hey, it's a start.

The Game Kitchen has slammed an adrenaline shot into 2D *Gaiden* and made a game that's far more interested in keeping your murderous momentum up than just repeatedly killing you. Enemies leap on screen and you're encouraged to slice them in two before they've even finished their intro animation. Ideally, you're doing this while sprinting forwards and with your next target in your swords' sights.

You play as Kenji, a student of usual protagonist Ryu Hayabusa, who's apparently too busy starring in the very first *Ninja Gaiden* to help out here. Kenji's got a basic sword slash attack, throwing knives and a Sonic-esque bounce that both hurts enemies and lets him use them as handy makeshift platforms, so at least they don't die in vain.

"Do you know where I can find some sailors?"

Once you unlock the shop you can buy a talisman that restores health on each kill, as long as you have at least a +3 kill streak going. Buy this immediately. It's the missing piece that makes the game absolutely sing as a ninja vampire sim, encouraging you to slice your way through as swiftly as you can.

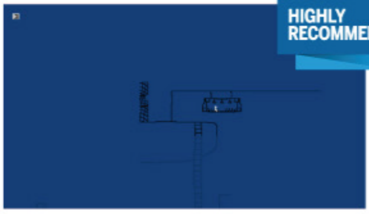
The last trio of bosses are brutal affairs that test every skill the game's taught you. Then there are the secret levels, which you'll find under a tab labelled SECRET LEVELS. These are far more hardcore, with some of the checkpoint placement apparently done by Satan while he was in a foul mood. If a tougher challenge is what you want from a *Ninja Gaiden*, you'll find it here. ■

VERDICT

★★★★☆

Ninja Gaiden: Ragebound is a fun revival of the hack-and slash series that opts for execution over innovation.

ABBIE STONE



PRICE Free
PLATFORM PC
WEB tinyurl.com/APC551shalguy

SHALGUY

Escape from the stress of the real world.

Given that every platformer is a *Metroidvania* now, and every *Metroidvania* is a Soulslike, discovering Shalguy was like stepping back in time to the days of early indie classics.

It's all in service of exploring a peaceful, minimalist world populated by interesting creatures and with pixel art that manages to be childlike yet packed with background detail.

In a game with no detectable walking animation, it's remarkable how tangible this world feels. The ambient sound effects fill in a lot of the gaps, as do the subtle colour transitions. And these are intricate, interconnected spaces, full of hidden areas and mysterious codes.

This game had its hooks in me. I was sat at my desk transported to its beguiling world, re-attaching my jaw every time it whipped out a fresh surprise.

VERDICT

★★★★☆

Pop the kettle on and make the time for *Shalguy*.

TOM SYKES

Pictured: absolutely every game, from 2023 until forever. Thanks, UE5.

TECH REPORT

Codebreakers

Threatened by homogeneity, PC gaming needs proprietary engines more than ever

Audio engineers will tell you a piece of music has 'that Pro Tools sound'. The track sounds cleaner, glossier, but overly digitised and brimming with artifice, they'll say, as you nod politely before being handed your change at the bar, putting a hand on their shoulder and giving them an 'enjoy your night, mate' before walking off.

In a similar way, PC gamers have all become accustomed to 'that Unreal Engine look'. You know the one. Really blurry textures for a half-second when your save game first loads. A faint plasticky look to every surface. More bloom than a garden centre. There are specific reasons UE games tend to look a certain way, like the material defaults that many developers don't change, and the multiplicative lighting solver that illuminates spaces in a distinctive way. The summation of those components, the recognisable look, used to be a fun little quirk, something you'd observe to yourself in the warmup phase of an *Unreal Tournament* match, or a massive gunfight that made you feel all clever in *BioShock*.

But somewhere along the way, as Unreal Engine's industry position changed from *an* option to *the* option, the quirk became a problem. Although it's not the case, it feels like every game we play was made on either Unreal Engine 4 or, in the most exotic cases, Unreal Engine 5. 'That Unreal Engine look' has started to become 'that videogame look'.

BRAVELY DEFAULT

Homogenisation hurts games more than any other entertainment media form, because of their unique capacity for immersion. A good film can make you feel like you were somewhere you weren't, but a good game leaves you with memories of the routes you walked and the people you spoke to while you were(n't) there. So if the visual appearance of one game starts to look like any number of others you played lately, that effect pulls you out of a virtual world and makes you think of the tool they used to build it instead.

Separate to the uniformity of the look it produces, there's also the minor issue of numerous UE5 games releasing absolutely borked. *STALKER 2*, *MindsEye*, the *Oblivion* remaster and even *Fortnite*, the flag-waving poster child for Epic Games, all fell foul of arriving with poor framerates or performance-based instability, and a longer list still seems to rely on AI upscaling to make up for the shortfall in native optimisation.

That doesn't mean Unreal Engine 5 is bad, or that building a game in it consigns that game to poor performance. But those ill-fated releases and over-familiar

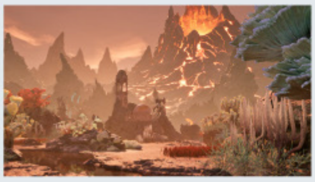
United they stand

Note that Unity has yet to be mentioned, but is in fact far more commonplace in PC gaming. While 3,295 Unreal Engine games released in 2024 according to SteamDB, 8,907 games came out that were built in Unity. So why single UE out? Because UE games tend to be the more visible releases, with some marketing spend behind them. And because UE's dominant look is, well, more dominant than Unity's. *Cuphead*, *Ori and the Blind Forest* and *Hearthstone* were all made in Unity, for example.

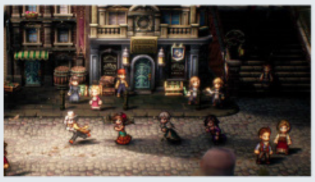
FAR LEFT: With Sony's first-party treats like *Horizon* routinely coming to PC, we see more proprietary engines used.

LEFT: If you want to make something as esoteric as *Death Stranding*, you need the right tools.

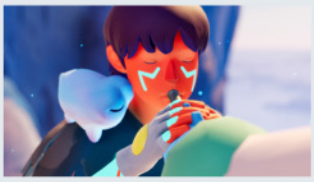
ON THE OTHER HAND... *Four games that mount a defence for UE*



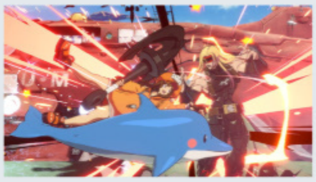
AVOWED
When it's wielded by old masters with a strong art direction, true beauty occurs. Like here, in fantasy RPG *Avowed.*



OCTOPATH TRAVELER II
A distinctive blend of 16bit pixel art and modern lighting. Looks – gasp – kind of different in its own way.



JUSANT
Minimalist. Colourful. Effortlessly cool, like an underground zine about climbing. It's UE in disguise.



GUILTY GEAR STRIVE
Cel-shaded chaos on a 2D plane. Looks like the 1990s game, was impossible in the 1990s.

look all contribute to a kind of gaming Groundhog Day effect. There's a sense that we're all basically just playing the same fundamental experience, over and over again.

PROPS TO YOU

And then you look at the list of notable recent releases that used a proprietary engine instead: *Baldur's Gate III*. *Elden Ring*. *Kingdom Come: Deliverance II*. The modern *Dooms*. *Death Stranding*. The *Horizons* and the *Last of Us* games (*Lasts of Us*?). And you think to yourself, hang on – is all this Unreal Engine holding us back a bit?

> THE MINOR ISSUE OF NUMEROUS UE5 GAMES RELEASING ABSOLUTELY BORKED

Certainly, I'm cherry-picking. During the time it takes to read this, several games have probably released which weren't made in Unreal and which will make not the faintest imprint on the cultural landscape. But what's striking about the best examples of recent games running on a bespoke game engine is that they all wanted to do something differently.

Larian wanted an incredibly reactive platform for D&D storytelling that could handle *Divinity*-like battles, endlessly branching player choices, and a cinematic RPG experience all at once. FromSoftware wanted to bring enigma and wonder back to open worlds, packing *Elden Ring* with secret crevices and allowing you to approach much of the game in the order you improvised.

Warhorse wanted medieval Bohemia to be recreated with forensic diligence, architecturally correct down to minute details, and with a radial melee combat system unlike any other games'. Hideo Kojima wanted... well, it's still not clear what Hideo Kojima wanted, but whatever it was, he succeeded in it and it's absolutely nothing like anything else in the medium.

In simplistic terms, it makes sense that in order to make a game that's distinct from the crowd, you'd build an engine that allows it to do those new and different things well. That statement loses a lot of nuance about what an engine is, and how developers use it. There are countless external component parts that plug into customer engines like Unreal and Unity, and they allow for a broad spectrum of genres and experiences.

SENSE OF SAMENESS

Still, the evidence is in the end product. The fact remains that we're all experiencing a growing sense of sameness in bigger-budget titles, and that the games that offer the finest experiences have often been built for purpose from their very foundations. It takes longer. It's more expensive. At a time when making games is harder than ever and both project cancellations and studio closures are depressingly commonplace, it doesn't feel right to demand that everybody start cutting from whole cloth. What we can do is vote with our wallets when the likes of *Metaphor: ReFantazio* turn up on proprietary engines. Gradually, we can send a message that giving studios the time and money to build experiences as they really want them to be realised is the formula for profit. That we care less about Lumen and Nanite than we do about a good concept, executed to a high standard, or a thought-provoking storyline. ■

Phil Iwaniuk

TECH TALES

Hit the Deck

Despite their overwhelming popularity, handheld PCs raise some tricky questions.

Handheld PCs aren't a new phenomenon. Atari's Portfolio released in 1989, for example, with a full keyboard and a modified version of DOS called DIP-DOS that allowed it to more or less run as an IBM-compatible PC. Hewlett-Packard released the HP-95LX two years later which ran on DOS itself. But it doesn't feel like devices like those have been at the heart of PC culture, or even in particularly high usage, throughout the platform's long history.

Not until 2022, when Valve released the Steam Deck. As soon as the company behind *Half-Life* gave us a glimpse of what looked like a futuristic Game Gear and flexed its gigantic brand power biceps, we seemed to decide that handheld gaming PCs were a) a thing, and b) a fun way to play PC games. Well I'm not having it.

> HAVE YOU PLAYED STARDEW VALLEY ON A HANDHELD GAMING PC?

I know the world's against me on this one. Since the Steam Deck's release, Razer, Asus ROG, MSI, Lenovo, and Logitech G have all made a play for a slice of the handheld gaming PC pie with models of their own. People bought those models, and had a nice time with them. I'm not here to debate that. But I am here to say: it isn't PC gaming.

What hardware like the Steam Deck and its army of third-party reinforcements do, other than foster in us a pathological impulse to observe the nearest plug socket on every train and in every coffee shop, is that they ask us to define what a PC is, and what gaming is.

CONTROL SCHEME

I'll go further. Have you played *Stardew Valley* on a handheld gaming PC? Great, isn't it? It feels like the natural conclusion to everything Game Boy RPGs were working towards, a little world whose perfect vantage point is observed from above, peering down between two thumbs, sitting somewhere comfy. Everything from the high-contrast pixel art to the simple button interactions feels right for a device like the Steam Deck. Not only does it definitely meet the criteria for PC gaming, it's also one of the all-time great examples of it.

However: I've also played *Control* on a handheld gaming PC. A precious, singular expression of Lynchian surrealism in playable form, a world where every conspiracy theory is true, and where the evidence of all of them is contained within one bureaucratic liminal space, rendered with breathtaking fidelity by a Remedy team that can work magic with pixels like no other studio. Playing it on a handheld feels like peeking through the letterbox in the front door of an IMAX cinema to catch a screening. *Control* is also an all-time great example of PC gaming, and it doesn't work at all on a portable platform.

I'm not saying it's impossible to have fun with *Control* on a Steam Deck, but rather the level of fun you can have playing it on a bigger, more immersive screen is so much higher that it seems a shame to deprive yourself of that immersion. And that raises, perhaps, some old-school thinking about both the platform and the idea of 'PC gaming'.

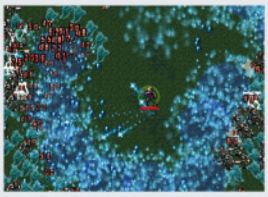
NAMING CONVENTIONS

A personal computer is such a broad technological term, it's hardly useful any more. Let's be honest: we mean the liquid-cooled, RGB monstrosity in a glass-panel case we'll be paying off until 2037. A gaming PC is the manifestation of a passion for fiddling with technology and seeking out performance. It's a rejection of the closed ecosystem compromises and low performance ceilings that consoles offer. Generally we have some say over the specs that go into our gaming PC, whether we're the ones to actually build it or not, and we reserve the ability to upgrade it, piece by piece, over time.

PHIL IWANIUK
Techno-luddite 'lancer Phil takes pride in train journeys without any entertainment media, sitting stock-still and staring into space.

POCKET ROCKETS *Four games that actually work for handhelds.*

THANK GOODNESS YOU'RE HERE!
Yes, perfect. A Yorkshire town, drawn in raucous colour and packed full of humour and puzzles.



VAMPIRE SURVIVORS
Not only does the bullet-hell survival roguelike feel natural to play on a handheld, it might even play better than on a desktop.

UNPACKING
You're not losing anything by playing this sedate meditation on arranging domestic spaces on a smaller screen.

PERSONA 5 ROYAL
By far the best exploration of Jungian psychodynamic principles available on handheld gaming platforms. Fact.

Handhelds… aren't that. They're not modular or customisable like desktop PCs are. They're not open ecosystems to the same extent desktop PCs are, because they often run on a modified OS and require specific per-game compatibility. Their default controls are analogue sticks, triggers and face buttons. Plugging in a mouse and keyboard is possible, but not practical. So why do we call them handheld PCs?

Probably because Steam made one, and marketed it in that way. Modern handhelds have as much in common with a PS5 as they do with a desktop PC from a hardware perspective, but they run on Windows, or SteamOS, and that seems enough to reassure us that peering into a minuscule screen to watch *Baldur's Gate III* run on medium settings while the battery drains like a lithium sieve constitutes PC gaming on the go.

I'm not saying bin them. I'm saying let's be real about what these devices are – a platform-agnostic supplement to our gaming main event. I'm glad they exist to help up smash out a *Persona* game on the train, but let's not call them gaming PCs. ■

Phil Iwaniuk

ABOVE: Is Phil so out of touch? No. It's the children who are wrong.

BELOW: Experiencing this Remedy meisterwerk on a handheld: a shame.

WHY I LOVE

Balmora, from The Elder Scrolls III: Morrowind

The RPG town that became more than just a hub: it was home.

IAN EVENDEN

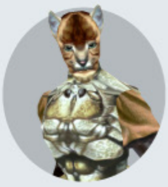
LEFT: The silt strider remains one of gaming's best ever fast travel options.

You have to start somewhere. And in Morrowind, that place is always the port of Seyda Neen. The ship that carries you from prison docks there, and you're sent into the customs house for some character creation and light pilfering. From there, however, you're on your own, a package-delivery quest pointing you to the town of Balmora and a man called Caius.

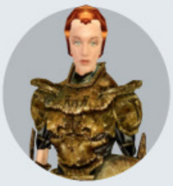
The world of *Morrowind* is huge and open. Its towns and cities exist as islands in a dangerous sea of wastelands and ash fields, and so your journey to Balmora is best undertaken quickly unless you want to fall prey to one of the most annoying creatures in videogames, cliff racers. You can take the silt strider for a few coins, an enormous chitinous flea piloted by a dark elf, and be in Balmora before you know it, just a loading screen away. You'll miss out on so much by doing this, though. It's not a long walk, and there are plenty of places to pick up weapons to fend off the cliff racers.

Take care to avoid being hit by the wizard who falls out of the sky, and you'll arrive at your destination. Balmora isn't going to win any prizes for its architecture. Compared to the remarkable Ald'ruhn with its town centre made from the shell of a giant crab, or Sadrith Mora with its council hall supported by mushrooms, House Hlaalu is a business-minded house, and has built a sensible settlement that has been allowed to grow into a successful town. The buildings may all be similar, influenced by Imperial ideas of mass production, but each one belongs to somebody.

FRIENDS OR TRAITORS *Who's who on the streets of Balmora*

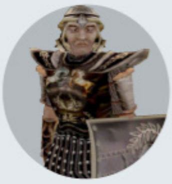


SUGAR-LIPS HABASI
Thieves Guild leader is a master trainer and source for tools – but only if you're a guild member.

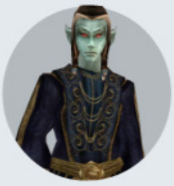


EYDIS FIRE-EYE
The Fighter's Guild boss also worships a daedric prince and serves the local crime syndicate.

CAIUS COSADES
The reason you're here: an old drug addict and ab-toting gym enthusiast who is also the imperial spymaster.



LARRIUS VARRO
Imperial Legion champion at the fort just outside Balmora. Encourages you to create a bloodbath of criminals.



RANIS ATHRYS
Steward of the Mages Guild and your go-to elf if you want magical training in the early game.

DARK CORNERS

Balmora is your friend, but not many of its inhabitants are. The dark elves' sneering greeting as you approach them, or questions as to what you are doing there, points to a distrust of outsiders from the locals that comes from past invasions and fears about what the influx of humans means.

Your contact, Caius, is a human spymaster living under the cover story of a hopeless junkie. He never wears a shirt, and an estate agent would describe his home as a cosy bedsit in need of some updating. More importantly, he offers you the use of his bed, and it's this that grounds you in the world. Caius sets you up with a base, some gold, and then sends you out into the world again to enjoy yourself. And you soon find that everything you need is right there in town.

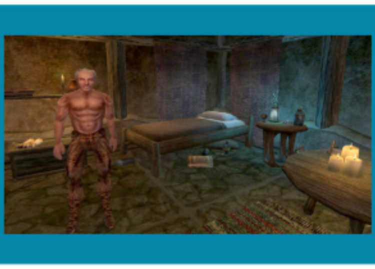
As an early hub town in a huge RPG, Balmora is a total success. It sets you up with quests, provides guilds to join, shops to trade with, trainers to learn skills from, inns to pick fights in and a hint of the society's shady underworld. It sits at the confluence of four of the island's regions and has roads and transport links to many more. More importantly, though, it's a wonderful sight as you jog back to it. The imposing Imperial Fort Moonmoth that stands to its south is the largest fortification you've seen thus far, and provides a feeling of protection. You know you're safe once within its walls – assuming you're not a wanted criminal by this early stage.

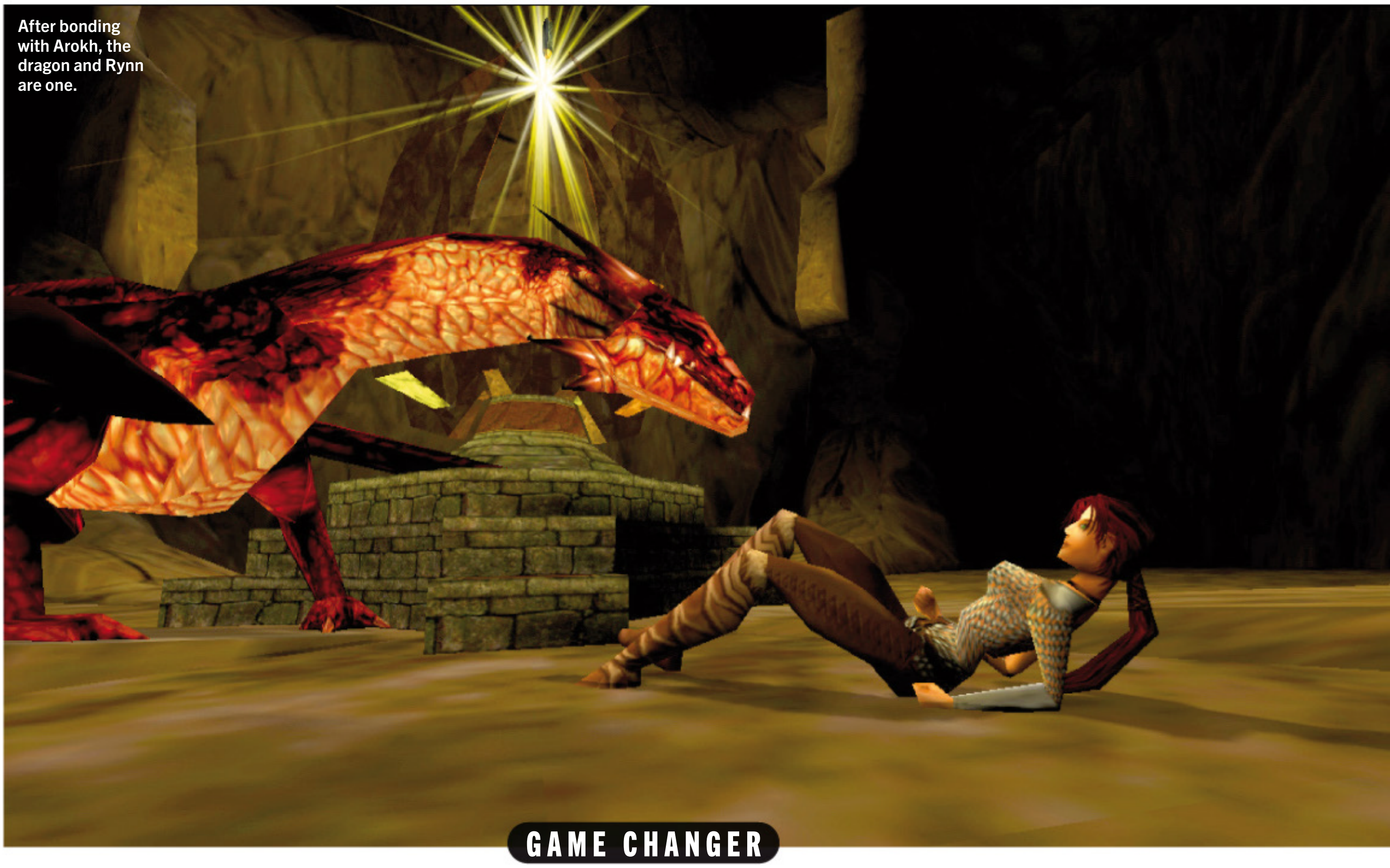
SHADE AND RESHADE

Sure, there are sights to behold in *Morrowind* that will take your breath away. It's one of the games best served by a high-res texture pack, as its looks betray the expectations of players' PC graphics cards of the time. But Balmora's dumpy buildings and xenophobic locals, its manors and working class district, and even its shady bars once you've cleansed them of criminals, provide an area of a game marked by dust and ash that's simply nice to be at home in.

And of course you'll leave Balmora behind you. There's an island the size of a small continent to explore, a world-changing plot and umpteen side-quests to follow. But sometimes it's nice to go back to where you came from, watch the sun going down over the river, and knock a cliff racer out of the sky with a single fireball – just for old times' sake. ■

RIGHT: Caius' home is basic, but it's a great place to do drugs. He should know.





After bonding with Arokh, the dragon and Rynn are one.

GAME CHANGER

RELEASE 1999 **DEVELOPER** Surreal Software **PUBLISHER** Psygnosis **WEB** tinyurl.com/APC551drakan

Drakan: Order of the Flame

A classic action-adventure PC exclusive that still brings the heat.

ROBERT JONES

You're Rynn, a slender and agile warrior who has, barely, survived her village being raided, sacked and burned to the ground by the orcish forces of Navaros, a fallen evil sorcerer set on resurrection and world domination. Everyone you knew or loved in the village is dead, slaughtered by the Wartok horde. Fallen men and women lie broken within burning buildings, which stand charred and wrecked, while crop plantations lie in ashes at your feet. There is one survivor, though, your brother Delon, who has been kidnapped by Navaros' minions and whisked away to act as the vessel for Navaros' return. And, as you stumble to your feet and grab your sword, his rescue is the only thing in your mind as your adventure begins.

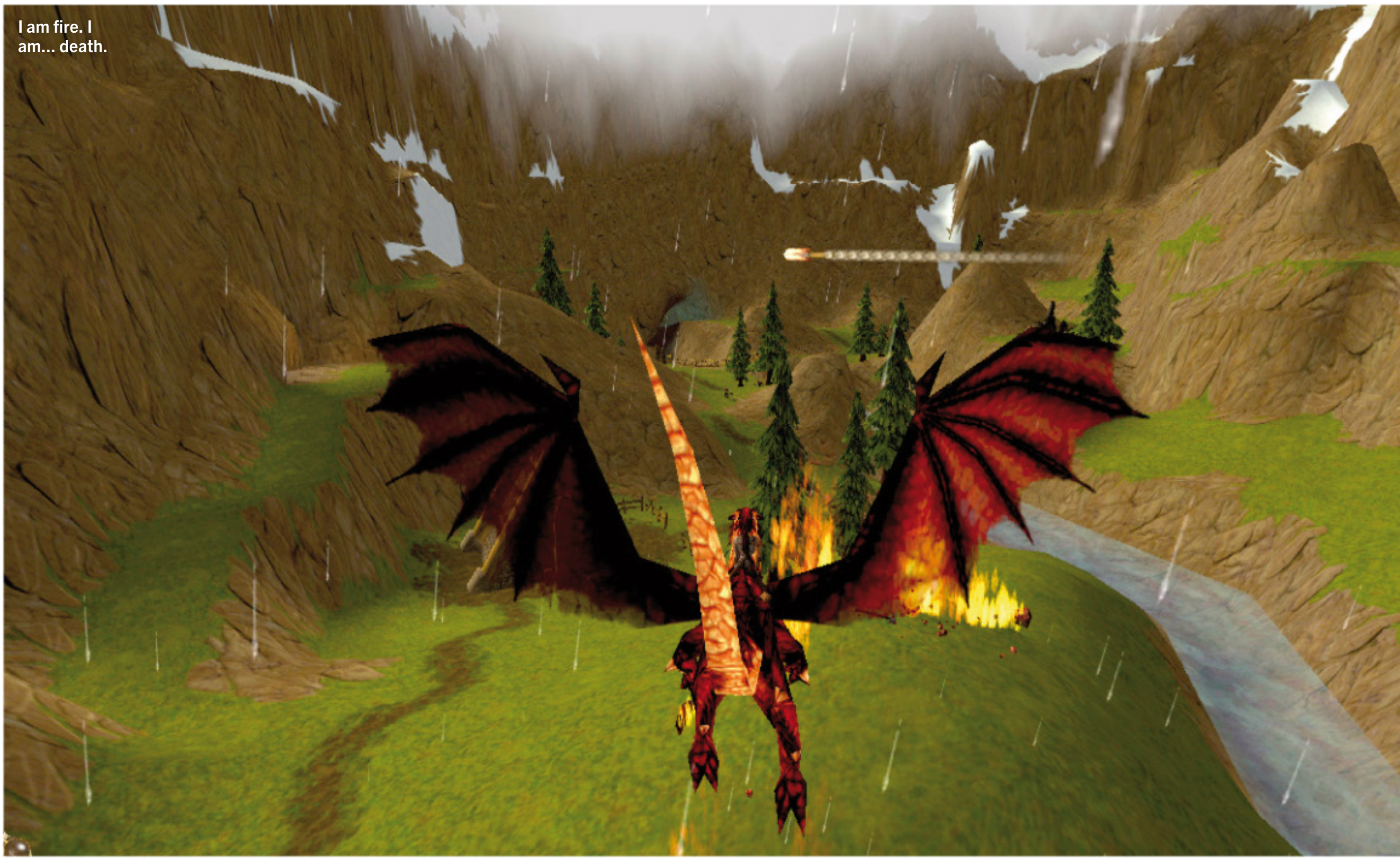
Of all the PC games that I've seen come and go over the last 30 years or so, I think *Drakan: Order of the Flame* is one of the most undeservedly unknown and underrated. If you've even heard of it, then you're already on your way into my PC gaming good books, whereas if you've already played it and are currently nodding knowingly as you read these words, then I salute you, sir or ma'am, for you are truly a person of exceptional gaming taste.

If you haven't, though, then step this way my friend, and let me take you back in time to discover an underrated PC exclusive classic that remains, decades later, laying dormant in the sands of time.

CRUCIBLE OF FIRE

An action-adventure slasher at its heart, *Drakan* recalls an age in PC gaming in the late 1990s and early 2000s when, for both good and bad, the industry was still far more like the Wild West than it is today, with a free, pioneering, experimental spirit felt very much throughout the medium. Big-budget games could take wild swings at new genre ideas and gameplay mechanics, typified in titles like Peter Molyneux's *Black & White* (2001), Will Wright's *The Sims* (2000), or Shiny Entertainment's underated gem *Sacrifice* (2000). And that's saying nothing of legendary game-changers like *Deus Ex* (2000), a game that could have only been born out of this era, where 'triple-A budget' and 'mad new shit' went hand in hand.

Today, while gaming is just as creative as ever, innovative new gameplay mechanics and ideas tend to come from small-scale indie



I am fire. I am... death.

developments, from the weird and wonderful games made by just a handful of devs that are free to implement new ideas in far more of a risky and corporate overwatch-free environment. I'm thinking of games like *Viewfinder*, *Balatro*, *Abiotic Factor*, *Animal Well*, *Pacific Drive*, *Deep Rock Galactic Survivor* and more. Compare the 'new' found in these games compared to the iterative content found in much of triple-A today and the change is clear: big-budget games today are more conservative than ever.

Released exclusively on PC in 1999, right in the heart of this pioneering period, *Drakan: Order of the Flame* was a game where just doing what everyone else had done was clearly not an option. So, while you step into the shoes of Rynn, a poweful warrior queen who more than a little bit will remind you of Lara Croft and the early (and clearly an influence on this game's developer, Surreal Software) *Tomb Raider* games, any idea of playing safe in the third-person action-adventure genre immediately melts away when you meet Arokh, the fire-breathing dragon who you will not only bond with, very much like in the movie Dragonheart, but then proceed to fly on and wage war with you throughout this world. Yes, I'm sorry to say that *Doom: The Dark Ages* got beaten to this specific punch 26 years ago.

LIKE A DRAGON

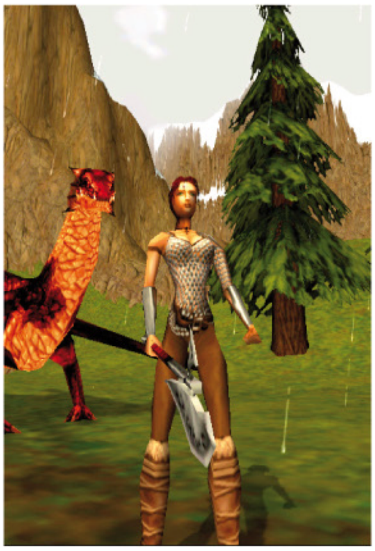
What's most remarkable, still, about playing *Drakan* is its seamless dragon-riding mechanics, and especially so considering this game was made over a quarter of a century ago. Rynn can call and mount Arokh at will, using his fireball and fiery breath attacks to incinerate enemies, both on the ground and the sky (rival dragons must be duelled with), before flying to a specific part of *Drakan*'s expansive levels to dismount Arokh and then proceed to hack, slash and explore on foot.

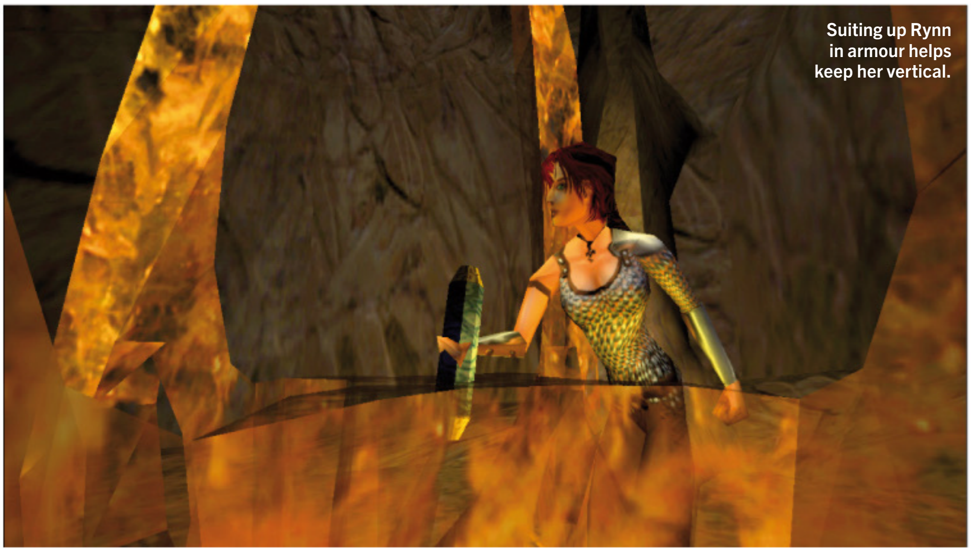
The result is a gameplay loop where, for the majority of the game, Rynn is fluidly fighting beasts on the ground, in caves, temples, crypts and more, before transitioning in moments to the skies on the back of Arokh, swooping, diving and outflanking enemies while bringing the heat to foes and structures alike. Wartock orcs, spiders, giants, goblins, zombies, scavengers, succubi and more all pose deadly threats on foot to Rynn, but under the intense heat of Arokh's dragon breath they are soon eradicated. This ability makes the times when you can lure enemies into the open, or to the entranceway of an interior area, only to then have Arokh torch them (he will fight foes on his own, too, if

ANCIENT WYRM

How to get Drakan running on modern PCs

Getting *Drakan* to run today on modern hardware is tough, especially so as no official remake or remaster exists (come on GOG!). If you own an original copy of the game, though, like I do, then I advise you to peruse the downloads section of the awesome and long-running *Drakan* fan site, Arokh's Lair (**arokhslair.net**), as it is a wealth of information and patches, both official and unofficial, that will help you get flying on Arokh today.

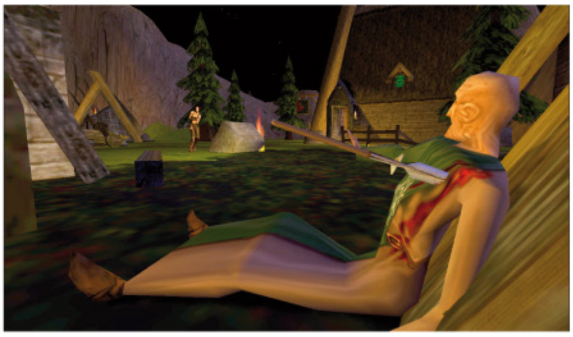




Suiting up Rynn in armour helps keep her vertical.

ABOVE: Mounting and dismounting Arokh is remarkably seamless, especially for a game released in 1999.

RIGHT: Just chilling out, spear in torso, as you do. Piña colada out of shot.



you are not mounted on him) all the sweeter. After all, your lifeforce is now bonded (if he dies you die, and vice-versa), and you must look out for each other.

There's something about the relationship that the game sets up and maintains between Rynn and Arokh, through cinematics as well as in-game vocals, that really immerses. Both Rynn and Arokh are fully voiced, and production values are high for the time, even if the quality of the voice acting (especially Rynn) now feels very dated by modern standards. Nevertheless, with plenty of banter and back and forth between these two stars of the game, it's hard not to get a feeling akin to that shared by Geralt and Roach in *The Witcher*. That Rynn and Arokh are joined in their mission is never in doubt, and that this feeling persists on replay after all these years is testament to the great work Surreal Software did here.

WAVES OF FLAME

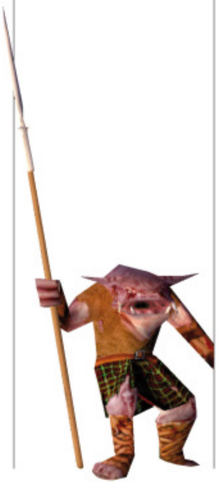
There's no doubting that the dragon-riding action is the star of the show in *Drakan*, with it built into the lore and plot of the game, as well as a central pillar of the gameplay. Action on Arokh was clearly influenced by the *Panzer Dragoon* series, the first three games of which released from 1995-1998, but those games were far more restrictive in their scope.

ACTION ON AROKH WAS CLEARLY INFLUENCED BY THE PANZER DRAGOON SERIES

Nevertheless, combat on Arokh is a case of strafing and outflanking foes while landing far-reaching fireball attacks, or close quarters fire breath attacks, and doing so while not getting hit yourself. It really is surprisingly similar to *Doom: The Dark Ages*, actually. What do they say about imitation being the best form of flattery? This is the game at its innovative best.

Gameplay off Arokh feels very *Tomb Raider*, but with a greater focus on up-close hack-and-slash combat. While perfectly playable today, this is the game at its iterative worst. Rynn can backflip, dive into bodies of water, nimbly side-dodge, forward roll and more, with a moveset that feels incredibly indebted to Miss Croft. In terms of attack and defence, though, Rynn can find and equip armour as well as a wide-number of shiny blades, axes and magic items, including health and invisibility potions. And she does this from a great inventory system, that when activated sees Rynn turn towards the player and stand ready while items are selected in a bottom-centre mounted inventory box overlay, like in an RPG. It's charming quite frankly, and a clear sign that this is a true PC game at heart.

When Rynn isn't attacking foes on foot, she's finding keys to open doors, flicking switches to open doors, or solving basic puzzles, some of why are (very basic) physics based. This is when *Drakan* feels most dated. However, the frustration of not finding a specific key aside, I don't feel they get in the way of enjoying its on-foot and dragon-mounted combat and story. So, yes. *Drakan* remains a cinematic fantasy adventure of genuine heart, and a bona fide PC classic that deserves re-appraisal today in terms of its impact on PC gaming. Fingers crossed the long-overdue remaster is incoming. ■



RETRO

Inspirational stories from computing's long-distant past

Commodore: The comeback

David Crookes looks at how a once powerful and influential tech brand hopes to shine once more, including an exclusive interview with Commodore's new owner.

Commodore was once one of the world's biggest names in computing. In its golden years, it sold more computers than Apple, IBM and Atari. That success was founded on the 8-bit Commodore 64, the best-selling single computer model of all time, while the 16-bit Commodore Amiga is a legend in its own right. That machine was powerful enough to drive the visual effects for the popular sci-fi series *Babylon 5*.

> ""We have completed the acquisition of Commodore." As he spoke, the details of the deal became clearer. The price was "in the low seven figures" and it had been funded, in part by angel investors.""

But Commodore's fall came almost as rapidly as its rise. It filed for bankruptcy in 1994 and saw its liquidated assets sold to Escom, which went bust two years later. Bits of Commodore then ended up in lots of different hands, and it became increasingly difficult not only to work out who owned what but to figure out what Commodore actually represented.

Over the past three decades, you'll have found the name plastered on an eclectic range of products from the Commodore XX gaming PC and Commodore PET smartphone to LED lightbulbs and a personal multimedia player called Gravel in Pocket. Some devices have even been hits. Consider the Commodore 64 Direct-to-TV (C64DTV) plug-and-play joystick, initially sold by QVC in 2004, which shifted in the tens of thousands.

While the Commodore name has lost some of its lustre, people still remember its products fondly. Other companies have preferred to tap into the nostalgia of Commodore products without actually mentioning the name: Retro Games Ltd showed this to be the case with the launch of THEC64 Mini and THEA500 Mini, machines that used familiar model monikers instead.

So does that mean no-one cares for the Commodore brand any more, or has it simply been waiting for the right approach?

A FRESH START

In June this year, a few months after he had stepped down from editing the Commodore 64-focused magazine *Zzap!64*, Christian "Perifractic" Simpson posted a YouTube video dubbed "Can We Save Commodore? My Biggest Project Yet!" His promise: to bring the Commodore brand back into the hands of fans and create new products.

Clearly passionate, Simpson spoke of his negotiations with the owners of Commodore Corporation B.V. – a company based in the Netherlands that was licensing the Commodore brand name – and ended the video with a tease. Simpson had received a message that showed his plan to seize control was very much within his grasp. "Yes, we can grant you an exclusive licence," the message said. "But your team seems to know Commodore better than we do. We might like to sell you the whole company."

Soon, Simpson was back. "As of a few

weeks ago, I am the acting CEO of Commodore Corporation," he declared. "We have completed the acquisition of Commodore." As he spoke, the details of the deal became clearer. The price was "in the low seven figures" and it had been funded, in part by angel investors.

The team included Bil Herd, the principal engineer on the Commodore Plus/4 and designer of the Commodore 128; Michael Tomczyk, the product manager for the VIC-20 computer; and a one-time Commodore tech support specialist called James Harrison. Not to mention David Pleasance, former joint managing director of Commodore 64, and Jeri Ellsworth, creator of the C64DTV.

"From Al Charpentier ('father of the C64') to Bil Herd to the former co-MDs of Commodore UK – each person brings history, expertise and heart," Simpson told *APC*. "I wanted to inject the DNA of the original Commodore into its reboot. Even Leonard Tramiel (son of Commodore's founder Jack) got involved, as our 'CTrO' (Chief Tramiel Officer)."

There was one other surprising name on the team – that of Thomas Middleditch, who played Richard Hendricks in the HBO television series Silicon Valley. It turned out he grew up with an Amiga and soon became enthused.

"I was a huge fan of the show, and one of our investors mentioned that Thomas was now looking to invest in tech startups. Life imitates art, huh?" Simpson said. "So an email introduction was made, a Zoom call followed, and the rest is history. Thomas recounted to me his love of his childhood Commodore Amiga 500 that he had in the house since the age of five. His ideas are breathtakingly cool."

ABOVE Commodore wants to be as transparent as the Starlight edition of the C64 Ultimate.

ULTIMATE DREAMS

This collective is now in a position to advise and support the new company while lending it a stronger link to the past. "It's not just a team. It's a reunion, and the passion behind this mission is contagious," Simpson said. "We didn't just pitch a product. We pitched a movement. And many of these legends told me they'd been waiting for someone to 'do it right'."

Simpson, too, has a long and passionate history with Commodore computers. "I grew up with a C64 that we bought from Dixons when I was around 12," he said. "It sparked my love of tech and creativity." Simpson even licensed the brand for the 2011 launch of the Commodore 64x, a replica Windows/Linux PC in a Commodore 64 case.

ABOVE Christian Simpson spearheaded the purchase of the Commodore brand.

The revived Commodore is certainly wasting no time. It has relaunched the C64 as the Commodore 64 Ultimate, with the development team including Gideon Zweijtzer, an electronic engineer who developed the Ultimate-64: this is a complete C64 motherboard replacement created in 2018. Then there's Jim Drew, who wrote disk copy programs, while Jake Young has been creating and selling C64 cases and keyboard accessories at Retro Fuzion.

The Ultimate recreates the original motherboard on an AMD Xilinx Artix-7 FPGA. This allows it to simulate the C64 accurately rather than emulate it in software, and it comes with a flurry of

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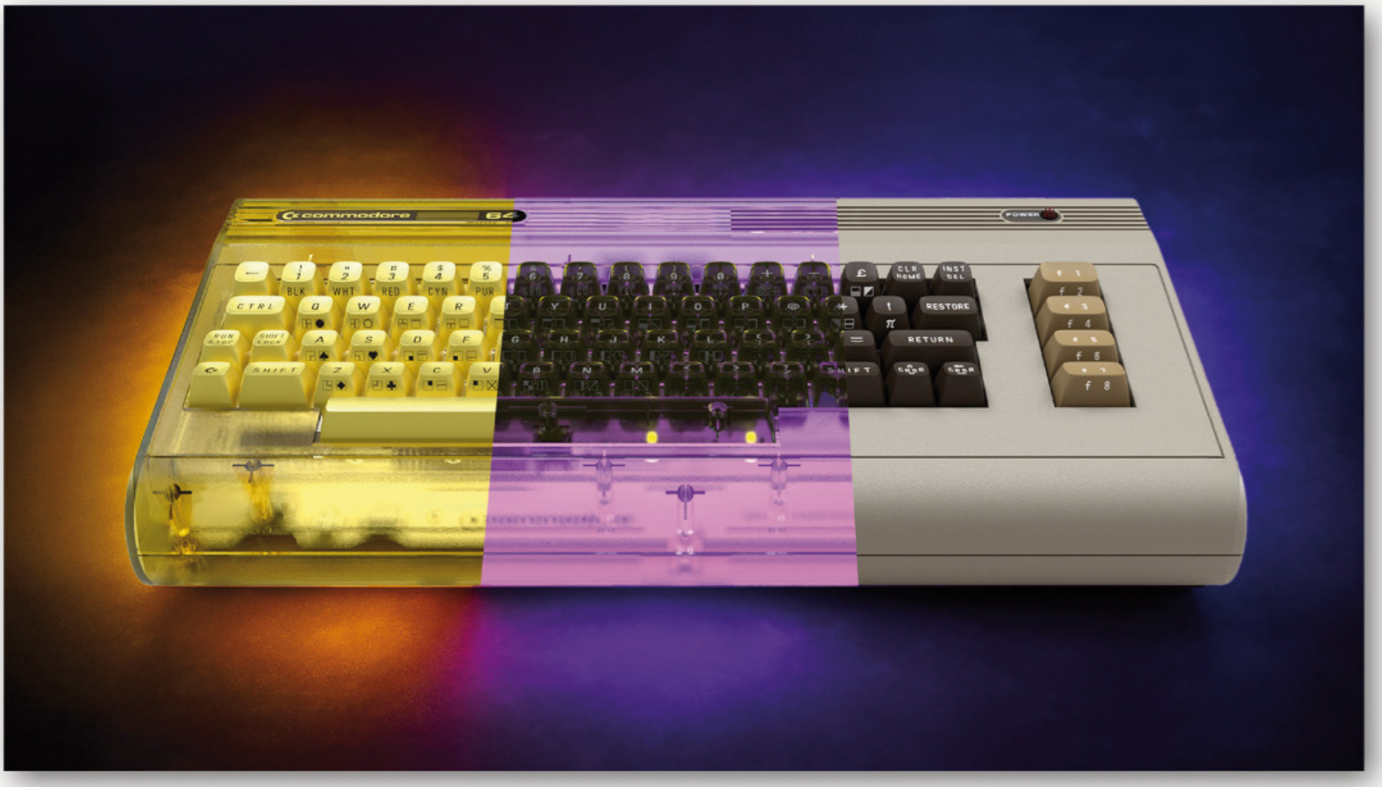
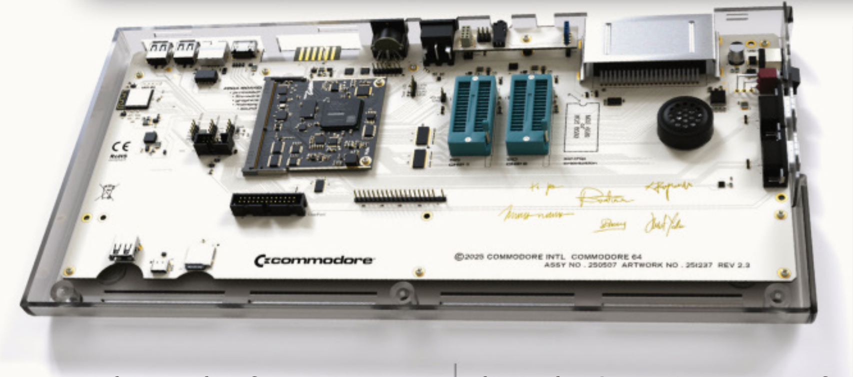




ABOVE There are three varieties of Commodore 64 Ultimate on offer.

LEFT The names of C64 creators, past and present, are etched on the new motherboard.

modern touches, from a 1080p HDMI output, USB-A and USB-C ports, built-in Wi-Fi and 128MB of RAM – a far cry from the 64K offered in the 1980s.

It's available in three iterations from **commodore.net**. There's a BASIC Beige edition for $452 that looks like the original, a gold Founders Edition for $754, while $528 will buy the Starlight Edition, complete with gaudy LEDs. All these prices exclude taxes. Whichever you choose, you can connect original C64 peripherals, including a tape deck, disk drive and "dusty old cartridges". Games can also be played via a thumb drive, including the bundled drive that resembles a cassette. To quote the tagline for the machine: "Retro gaming. Modern power."

Within the first week or so, around 4,200 Commodore 64 Ultimates had been sold, with the base model accounting for half those sales. Generating revenues of more than $1.5 million, it proves there's a strong appetite for revived machines. Nor is it alone: the third iteration of the ZX Spectrum Next computer on Kickstarter achieved roughly the same numbers within three days. But why?

Simpson says the Ultimate is proving to be attractive because it trades on authenticity and an enhanced experience. "Past reboots have been really cool emulators, but still emulators," Simpson said. "They do a fine job, but some people prefer authentic hardware. Part of that is 'knowing' that it's real, not software emulation. The other part is latency (how much a game may be delayed after pressing fire, for example).

"FPGA hardware like ours just runs faster as it's happening at the bare metal level, not in code. This is the real deal – a hardware recreation, modernised respectfully. There's so many cool touches we've added that have never been available before."

LONG-LASTING

Despite the strong start, a good number of sceptics remain. The main issue is that past attempts to revive Commodore as a company have failed to set the world alight. It doesn't help that ownership of the original company's assets are in different hands.

Some people have also pointed out that the target market, certainly as it stands, is sure to be limited. The Commodore 64 Ultimate is a niche product that primarily appeals to retro computer enthusiasts, but Simpson says plans are afoot that will combine retro with futurism. That's reflected in the company's website, which states it is "Honouring the past. Innovating the future".

Simpson certainly understands he has a job on his hands. "I get it. There have been too many false starts. People have been rug-pulled by YouTubers before," he said. "But we're not here to sell nostalgia – we're here to earn it."

His aim is to create products that will linger long in the mind. "When people look back in 30 years, I want it to be our Commodore they're nostalgic for and I want it to still be there right next to them. That's my dream," he added.

"Our actions are already different: not many companies would be as transparent as we are through our crowdfund product launch, where we show exactly how many units of the Commodore 64 Ultimate have been preordered. We're building trust one step at a time. If you're sceptical, good. We'll prove it through execution, not words."

One thing he is keen not to foster is a "them and us" situation. There is a thriving community of enthusiasts keeping Commodore's past machines alive, from those who simply play games and invest in hardware to those who actively develop them. Such developments allow people to expand the capabilities of their computers and try something new. Simpson says the new company will seek to work with others, not against them.

"We're offering affordable licensing, promoting community mods, and partnering with key creators, all under quality control guidelines that protect the brand while empowering the makers," he said. "Think open standards, trusted partners and fair royalties. We're not out to squash the little guy. We are the little guy! We came from the community, hence the hashtag #WeAreCommodore.

"People have been understandably worried that we'd do a Nintendo and go all lawyery on them, but that's just not in my spirit. If you're using the Commodore name harmlessly such as in your YouTube handle, that's cool. If you're using the branding to make a profit, we can support you with a place on our upcoming web shop to drive you more sales."

MAKING FRIENDS

Plans are also ongoing to work with those who own the rights to the Amiga. For instance, the director of Cloanto, Mike Battilana, owns Amiga Corporation, and this holds the Amiga trademarks and copyrights. Hyperion Entertainment has an exclusive licence to develop and market AmigaOS 4.

As Retro Games Ltd found in its bid to produce a replica of the Amiga 1200, legal disputes can get in the way of progress. Simpson is hopeful that, one day, the way forward will be simpler. "We're in very positive, respectful talks with Mike Battilana," he said. "Our dream is to reunite the Commodore and Amiga families, but only with care and cooperation, not the mistakes of the past. It won't happen overnight, but the desire is mutual. Watch this space."

In the meantime, Commodore is forging ahead. As well as the Commodore 64 Ultimate, it sells the Commodore 64X PC alongside joysticks and a range of merchandise from dog-tag necklaces and mouse pads to sweatshirts and cotton tees. The company is also looking to do some good in the wider world with a scheme called Commodore Care.

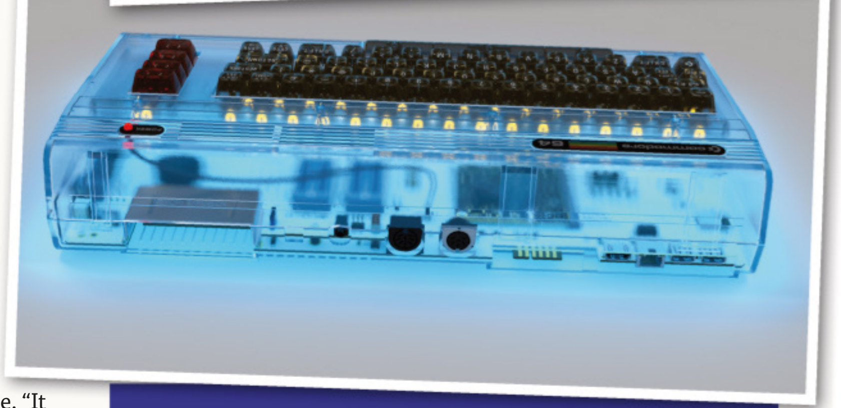
"It's about giving back," Simpson said. "Commodore Care intends to make life fairer for underprivileged kids, by giving them Commodore computers, so they may one day look back and feel that happiness we feel when we look back – but that they otherwise might not feel. Commodore did that for me, and so many others, and I want it to do the same for them."

The company is also setting up the Commodore 80s Dream Arcade at Caudwell Children's headquarters in Newcastle-under-Lyme in Staffordshire. "It will be a physical space for children with ADHD and autism to play, connect and explore retro tech. It simply reflects my belief that nostalgia can do good in the world," he added.

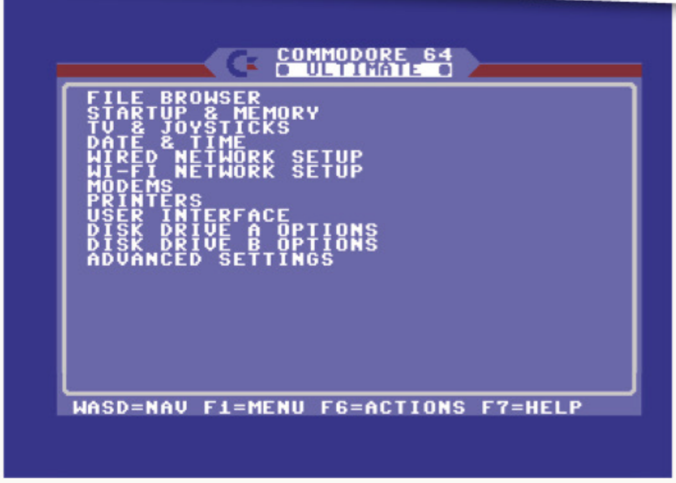
To that end, Simpson is clear that the Commodore 64 Ultimate is only the start, yet lays down a marker for what is yet to come. "Think of modern hardware wrapped in nostalgic charm," he said. "The Commodore 64 Ultimate is FPGA-powered, glows with game-reactive light, and runs real dusty 80s cartridges, or shiny new D64s on USB 'cassette'. But there are two pillars I'm building Commodore on: retro and futurism. We can't just look back.

"We will have future products that will blend that retro soul with digital detox innovation – including transparent tech and distraction-free design. The goal will be to give people a way out from today's 'technology gone too far'. I can't say too much about our products already in development, but they are going to ride that wave as any good Commodore should." ■

TOP Commodore hopes that reviving the brand will strike gold for the firm.



MIDDLE The back of the Commodore 64 Ultimate includes modern ports.



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DISK DRIVE B OPTIONS
ADVANCED SETTINGS
WASD=NAV F1=MENU F6=ACTIONS F7=HELP
```

BOTTOM The C64 Ultimate's menu allows you to set up various components.

Worried that something nasty might be lurking in his web browser, **Robert Irvine** tries to…

Test the safety of extensions

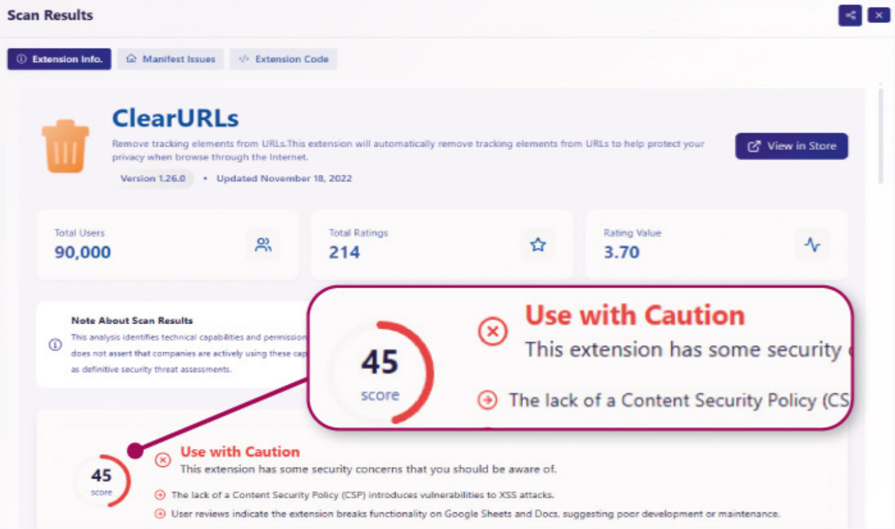
In the classic film *Invasion of the Body Snatchers* (either the 1956 or 1978 version – they're both good), aliens infiltrate society by replacing human beings with sinister clones. Which is not dissimilar to the way malicious browser extensions are masquerading as legitimate tools, so they can steal users' data and infect their PCs.

Barely a week goes by without new reports of dodgy Chrome extensions somehow evading Google's 'strict' security checks and threatening millions of users. Some of these nasty add-ons pretend to be popular tools such as VPNs, AI assistants and video downloaders (see **tinyurl.com/APC551fake**). Others are maliciously modified versions of existing extensions that have been sold or abandoned by the original developers.

Either way, they're becoming more prevalent and – like the 'pod people' in Body Snatchers – they could already be among us. I install lots of extensions in the course of my job, and often forget to remove those I no longer use. Could my browser be harbouring malicious add-ons that are secretly collecting my data and compromising my security?

To find out, I first tried Chrome's Safety Check feature, which is supposed to detect and warn you about dodgy extensions. I opened the browser's Settings, selected 'Privacy and security' and clicked the 'Go to Safety Check' button. This confirmed I had Enhanced Safe Browsing enabled and "Nothing else needs your attention at the moment". I also checked the Extensions page (type **chrome://extensions** into your address bar) to see if Chrome had flagged any tools as risky. But the only one it had turned off was uBlock Origin, "because it is no longer supported" – the culmination of Google's long-running war against the popular content blocker.

The lack of red warnings should have reassured me that all my extensions were safe, but sadly it didn't. Chrome hardly performed an in-depth check, and it's Google's casual attitude to browser security that has led to the rise in malicious add-ons in the first place.



Scan Results

Extension Info. | Manifest Issues | Extension Code

ClearURLs

Remove tracking elements from URLs.This extension will automatically remove tracking elements from URLs to help protect your privacy when browse through the Internet.

Version 1.26.0 • Updated November 18, 2022

View in Store

Total Users	Total Ratings	Rating Value
90,000	214	3.70

Note About Scan Results

This analysis identifies technical capabilities and permission does not assert that companies are actively using these cap as definitive security threat assessments.

45 score

Use with Caution

This extension has some security

The lack of a Content Security Policy (CS

45 score

Use with Caution

This extension has some security concerns that you should be aware of.

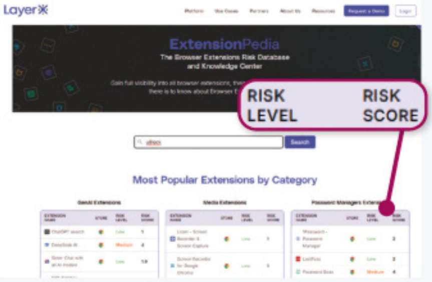
The lack of a Content Security Policy (CSP) introduces vulnerabilities to XSS attacks.

User reviews indicate the extension breaks functionality on Google Sheets and Docs, suggesting poor development or maintenance.

CRXplorer warned Robert to use the ClearURLs extension with caution.

So I next tried a website called CRXplorer (**https://crxplorer.com**), which scans browser extensions for suspicious permissions and code. This looked very promising, providing a list of recently scanned extensions such as Tampermonkey, ClearURLs and Grammarly. Clicking the Scan buttons next to these displayed CRXplorer's reports, which analysed each tool's security and privacy policies – including 'data-collection capabilities' – and gave it a safety score. For example, ClearURLs received a score of 45 (out of 100 – see screenshot above), with red warnings to use it with caution because it lacks a content-security policy.

Disappointingly, when I searched for some of the more obscure extensions I have installed, CRXplorer couldn't find them. Even well-known tools such as the new-tab-page customiser Momentum weren't in its database.


LayerX
ExtensionPedia
The Browser Extensions Risk Database
and Knowledge Center
RISK LEVEL
RISK SCORE
Search
Most Popular Extensions by Category

ExtensionPedia provided risk levels and scores for every extension Robert searched for.

My final stop was the new website ExtensionPedia (**https://layerxsecurity.com/extensions**), which is described by its creator, security company LayerX, as a "Wikipedia for extensions". This evaluates the security of more than 200,000 Chromium and Firefox add-ons, which I was pleased to discover included all the extensions I had installed.

ExtensionPedia gives each tool a colour-coded risk level and an overall risk score (see screenshot below left), and rates the 'severity' of every permission it requires. It also gives extensions a 'reputation risk' rating, based on its developer, number of installs and user reviews. Other information is only available to LayerX business customers.

I actually preferred CRXplorer's presentation of reports and its more in-depth analysis, so it's a shame it doesn't cover a wider range of extensions. Between the two sites, I was able to identify nearly a dozen tools with dubious privacy policies and unnecessary permissions, which I uninstalled immediately. Incidentally, both declared uBlock Origin to be safe to use, which just goes to show what Google knows. ■

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Product testing for the real world

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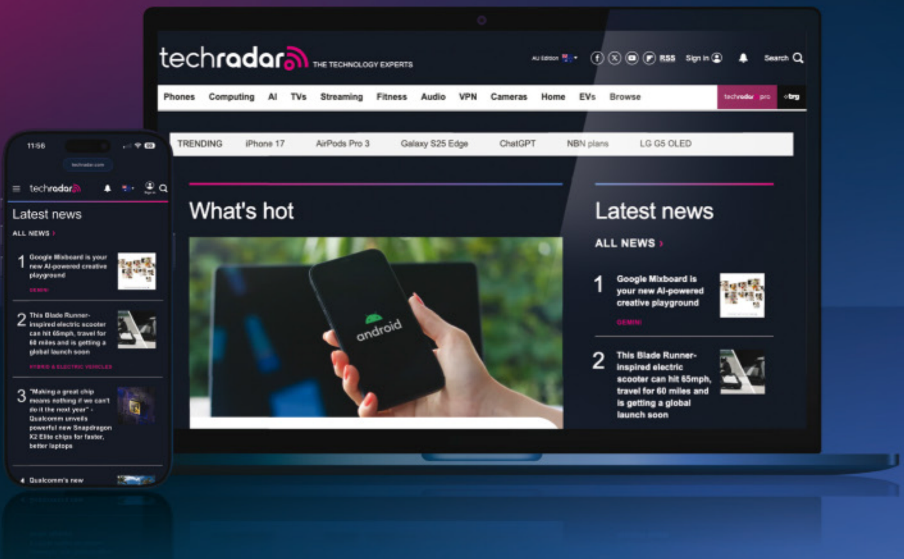

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